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Thorax

AN INTERNATIONAL JOURNAL OF RESPIRATORY MEDICINE

British Thoracic Society Winter Meeting 2021 Online

Wednesday 24 to Friday 26 November 2021

Programme and Abstracts

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We are now entering the post-peak phase of the global COVID-19 pandemic and a safe return to respiratory diagnostic testing is being advised. We've created a helpful guide to get you started.

With a return to diagnostic spirometry in primary care, we know that patient safety is of paramount importance to you. The pandemic has taught us that we must rethink how to perform pulmonary function testing within general practice settings. Patient and practitioner safety, and the reduction of virus transmission are the main priority.

International guidance has been reasonably consistent on the considerations for resuming pulmonary function services and testing post-COVID.

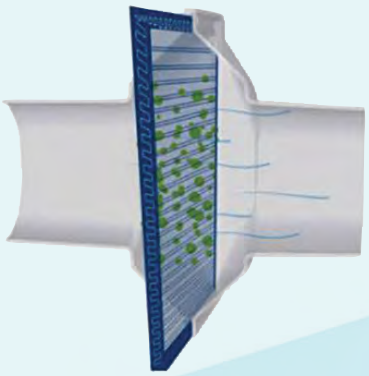
We have summarised guidance from the ARTP, PCRS, BTS and ERS into 5 key considerations.

Download Guide

Bacterial Viral Filters (BVFs) for safe spirometry testing

Single-use BVFs are the best way to perform safe pulmonary function testing within your practice.

The Association for Respiratory Technology and Physiology (ARTP) and the Primary Care Respiratory Society (PCRS) recommend using antibacterial antiviral filters.



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PROGRAMME

AND

ABSTRACTS

Thorax

British Thoracic Society
Winter Meeting 2021 Online

Wednesday 24 to Friday 26 November 2021
Programme and Abstracts

Approved by the Federation of the Royal Colleges of Physicians of the UK for 18 category 1 (external) credits (6 credits per day).
Code: 137106

DAILY PROGRAMME OVERVIEW WEDNESDAY 24 NOVEMBER 2021

All sessions will be shown online live at the times below, and will be available to view via the relevant 'session type' tab online.

All posters will be available to view in the Poster Hall throughout the three days, with poster presentations and live discussion at the programmed times.

Time	Session Type		Session Title
07:30-18:00	Poster viewing on demand throughout the day	P1-P7	ILD: how big is the problem? How can you spot it and how should you monitor it?
		P8-P17	Clinical developments in non-invasive ventilation and sleep
		P18-P28	Virtual monitoring in COVID-19
		P29-P41	Advances in the management of TB and NTM infections
		P42-P55	Diagnostics and monitoring of asthma and co-morbidities
08:00-08:30	BTS Journal Club		Vasculitis and the lung
08:30-10:30	Joint BTS/BALR symposium – part 1		Fighting the fire in airway inflammation and bacterial colonisation
08:45-10:05	Spoken session	S1-S5	The clinical management of acute asthma
08:45-10:05	Spoken session	S6-S10	Stay awake! It's an update on sleep
08:45-10:05	Spoken session	S11-S15	Probing the pleural space
08:45-09:50	Spoken session	S16-S19	Predictive tools for acute deterioration in COVID-19 and beyond
08:45-10:15	Symposium		Translation of scientific advances into patient benefit
08:45-10:15	Symposium		Moving on in pulmonary rehabilitation after COVID-19
10:30-10:40	BTS News Broadcast		Live daily preview
10:45-11:45	Poster session	P1-P7	ILD: how big is the problem? How can you spot it and how should you monitor it?
10:45-12:00	Poster session	P8-P17	Clinical developments in non-invasive ventilation and sleep
10:45-12:15	Joint BTS/BPRS symposium		The child is father of the man
10:45-12:20	Spoken session	S20-S25	The new normal? Novel and remote strategies for pulmonary rehabilitation
10:45-12:20	Spoken session	S26-S31	COPD exacerbations: prevention, treatment, recovery
11:00-13:00	Joint BTS/BALR symposium – part 2		Novel approaches to extinguishing lung dysbiosis
13:00-13:45	Guest Lecture: The BTS Scientific Lecture		The global challenge of ageing
13:45-14:00	BTS News Broadcast		Interview time
14:00-15:25	Poster session	P18-P28	Virtual monitoring in COVID-19
14:00-15:30	Symposium		COPD: scaling new heights
14:00-15:30	Symposium	T1-T6	Joint BTS/BALR/AUK-BLF Early Career Investigator Award symposium
14:00-15:30	Symposium		Updates in the pathogenesis, prognosis and treatment of ILD
14:00-15:40	Poster session	P29-P41	Advances in the management of TB and NTM infections
14:00-15:45	Poster session	P42-P55	Diagnostics and monitoring of asthma and co-morbidities
16:00-16:15	Guest Lecture / BTS Awards		Awards presentation
16:15-17:00	Guest Lecture / BTS President's Address		The changing faces of respiratory medicine
17:15-17:45	BTS News Broadcast		Twilight highlights

DAILY PROGRAMME OVERVIEW THURSDAY 25 NOVEMBER 2021

All sessions will be shown online live at the times below, and will be available to view via the relevant 'session type' tab online.

All posters will be available to view in the Poster Hall throughout the three days, with poster presentations and live discussion at the programmed times.

Time	Session Type		Session Title
07:30-18:00	Poster viewing on demand throughout the day	P56-P61	Cough: is it a problem and what can we do about it?
		P62-P72	Breaking barriers in pulmonary rehabilitation and physiotherapy
		P73-P78	Virtually perfect: remote medicine and digital health
		P79-P85	The real-world care of COPD patients
		P86-P97	COVID-19: clinical features and risk
		P99-P112	The wider impact of the pandemic
08:00-08:30	BTS Journal Club		"Hot off the press" clinical trials
08:30-10:00	Symposium		Year of the Nurse: a spotlight on nurse research leadership
08:30-10:00	Joint BTS/BPRS symposium		Interstitial lung disease across the developmental divide
08:30-10:30	Symposium		Chronic respiratory disease in low-income and middle-income countries (LMICs): from challenges to solutions
08:45-10:05	Spoken session	S32-S36	Treatment and adherence in asthma
08:45-10:05	Spoken session	S37-S41	Beyond acid-fast: diagnosis and treatment of TB in the 21st Century
08:45-10:20	Spoken session	S42-S47	What goes down, must come up: oscillation, obstruction and lung physiology
08:45-10:20	Spoken session	S48-S53	Developing treatments for COVID-19
10:30-10:40	BTS News Broadcast		Live daily preview
11:00-11:50	Poster session	P56-P61	Cough: is it a problem and what can we do about it?
11:00-12:05	Spoken session	S54-S57	Understanding COVID-19 mechanisms
11:00-12:20	Spoken session	S58-S62	Treatment choices in CF and bronchiectasis: what works and when
11:00-12:20	Spoken session	S63-S67	What's in a genotype? Unpicking genetic links in complex disease
11:00-12:25	Poster session	P62-P72	Breaking barriers in pulmonary rehabilitation and physiotherapy
11:00-12:30	Symposium		COVID-19: we planned, we delivered, what has changed?
11:00-13:00	Symposium		TB: global lessons for all!
12:30-13:00	Symposium		INSPIRE – a national respiratory trainees research network
12:45-13:00	BTS News Broadcast		Interview time
13:00-13:45	Guest Lecture: The BTS Clinical Lecture		Early COPD cohort data
14:00-14:50	Poster session	P73-P78	Virtually perfect: remote medicine and digital health
14:00-15:00	Poster session	P79-P85	The real-world care of COPD patients
14:00-15:30	Symposium		Highlights from *JAMA* and *Thorax*
14:00-15:30	Symposium		Non-tuberculous mycobacteria: translating science into cutting edge care
14:00-15:30	Symposium		BTS audit and quality improvement
14:00-15:30	Poster session	P86-P97	COVID-19: clinical features and risk
14:00-15:45	Poster session	P99-P112	The wider impact of the pandemic
16:00-17:30	Symposium		Recent advances in CF: what's relevant to other diseases?
16:00-17:45	Symposium		Plenary Scientific
18:00-18:30	BTS News Broadcast		Twilight highlights

DAILY PROGRAMME OVERVIEW FRIDAY 26 NOVEMBER 2021

All sessions will be shown online live at the times below, and will be available to view via the relevant 'session type' tab online.

All posters will be available to view in the Poster Hall throughout the three days, with poster presentations and live discussion at the programmed times.

Time	Session Type		Session Title
07:30-18:00	Poster viewing on demand throughout the day	P113-P119	Thinking outside the lung: monitoring and management of patients with CF, PCD and bronchiectasis
		P120-P129	Improving care pathways in adults and children
		P130-P143	COVID-19 recovery: predicting long term outcomes
		P144-P152	Assessing, managing and predicting outcomes in ILD
		P153-P161	New treatment pathways in the post-COVID-19 era
		P162-P172	Topics in thoracic malignancies
		P173-P183	Perspectives on education, training and research collaboration
		P184-P190	Fighting back: optimising treatment for COVID-19
		P191-P199	Perspectives on pleural disease
		P200-P209	Asthma: phenotyping and the response to biologics
		P210-P220	Oxygen, CPAP, NIV or ICU: what works in COVID-19?
08:00-08:30	BTS Journal Club		Sleep
08:30-09:50	Spoken session	S68-S72	Gazing through the crystal ball: predicting outcomes from COVID-19
08:30-09:50	Spoken session	S73-S77	A cut above: an update in thoracic surgery
08:30-09:50	Spoken session	S78-S82	Under pressure: an update in pulmonary vascular disease
08:30-10:00	Symposium		State of the art pleural disease management: latest evidence from UK trials
08:30-10:00	Symposium		The challenge of medicine non-adherence in respiratory disease
08:30-10:00	Symposium		Exploring the ill-explored: identifying occupational risk factors for lung disease
08:30-10:05	Spoken session	S83-S88	Biologics for asthma
10:05-10:15	BTS News Broadcast		Live daily preview
10:30-11:30	Poster session	P113-P119	Thinking outside the lung: monitoring and management of patients with CF, PCD and bronchiectasis
10:30-11:45	Poster session	P120-P129	Improving care pathways in adults and children
10:30-11:50	Spoken session	S89-S93	New insights into airways disease
10:30-12:00	Symposium		A journey through clots, COVID-19 and chronic thromboembolic disease
10:30-12:00	Symposium		Latest advances in immunotherapy for lung and pleural malignancy
10:30-12:05	Spoken session	S94-S99	From bench to lung: scientific advances in respiratory research
10:30-12:15	Poster session	P130-P143	COVID-19 recovery: predicting long term outcomes
12:15-12:30	BTS News Broadcast		Interview time
12:30-13:15	Guest Lecture: The BTS Grand Challenge Lecture		Child poverty and health inequalities
13:30-14:40	Poster session	P144-P152	Assessing, managing and predicting outcomes in ILD
13:30-14:40	Poster session	P153-P161	New treatment pathways in the post-COVID-19 era
13:30-14:50	Spoken session	S100-S104	Ease that wheeze: managing risk in COPD
13:30-14:55	Poster session	P162-P172	Topics in thoracic malignancies

DAILY PROGRAMME OVERVIEW

FRIDAY 26 NOVEMBER 2021

Time	Session Type		Session Title
13:30-14:55	Poster session	P173-P183	Perspectives on education, training and research collaboration
13:30-15:00	Symposium		Pulmonary infection horizon-scanning: what could go wrong now?
13:30-15:30	Symposium		The asthma science symposium: deep phenotyping into actionable insights
15:15-16:45	Symposium		Air pollution: the greatest environmental health risk of our time
15:15-17:15	Symposium		Machine learning and data science to improve patient care
15:30-16:30	Poster session	P184-P190	Fighting back: optimising treatment for COVID-19
15:30-16:40	Poster session	P191-P199	Perspectives on pleural disease
15:30-16:45	Poster session	P200-P209	Asthma: phenotyping and the response to biologics
15:30-16:55	Poster session	P210-P220	Oxygen, CPAP, NIV or ICU: what works in COVID-19?
15:45-17:30	Symposium		To vape or not to vape, that is the question
17:30-18:00	BTS News Broadcast		Twilight highlights

THE EXHIBITION

The British Thoracic Society gratefully acknowledges sponsorship from the under listed companies, through the purchase of online exhibition space at the Winter Meeting 2021. None of them have had any input into the programme content or the planning of the conference. Furthermore, the Society does not allow any sponsored symposia at this event, within the programme or associated in any way with it.

Participants are encouraged to visit the online exhibition stands and to make contact with the company representatives. Their support has helped ensure that the Society has been able to organise a first-class online platform.

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SERETIDE

salmeterol/fluticasone propionate

BE PROACTIVE. CONTROL ASTHMA

- *Seretide has been proven to achieve and maintain guideline-defined asthma control, including exacerbation reduction, in a RCT*[1]
- *3 out of 4 patients who achieved guideline-defined control remained controlled after 1 year*[1]

……Step up your uncontrolled asthma patients (≥12 years) on ICS & PRN SABA to Seretide Evohaler, where clinically appropriate

Seretide (salmeterol xinafoate and fluticasone propionate) Prescribing Information (Please refer to the full Summary of Product Characteristics (SPC) before prescribing)
Seretide is available in the form of an Evohaler or Accuhaler. Uses: Asthma (Evohaler and Accuhaler): Regular treatment of asthma, where use of a combination product (LABA and ICS) is appropriate, i.e. patients not adequately controlled on both ICS and 'as needed' short-acting inhaled bronchodilator or patients controlled on ICS and LABA. Note: Seretide 50 Evohaler and Seretide 100 Accuhaler are not appropriate in severe asthma. COPD (Accuhaler only): Symptomatic treatment of patients with COPD with a FEV_1 <60% predicted normal (prebronchodilator) and a history of repeated exacerbations, who have significant symptoms despite regular bronchodilator therapy. **Dosage and administration: See SPC for more detail on dosing** Inhalation only. Asthma: *Adults and adolescents ≥12 years:* Seretide Accuhaler- one inhalation b.d. of Seretide 100, 250 or 500 Accuhaler or Seretide Evohaler – two inhalations b.d. of Seretide 50, 125 or 250 Evohaler *Children 4-11 years:* Seretide 50 Evohaler two inhalations b.d. Volumatic or AeroChamber Plus spacer device use recommended. Seretide 100 Accuhaler one inhalation b.d. Maximum licensed dose of fluticasone propionate delivered by Seretide inhaler in children is 100 micrograms twice daily. Regularly review patients and reduce dose to lowest that maintains effective symptom control. Where the control of symptoms is maintained with the lowest strength of the combination, patients may be prescribed an inhaled corticosteroid alone stepped down. COPD: one inhalation b.d. of Seretide 500 Accuhaler. **Contraindications:** Hypersensitivity to active substances or excipient; Accuhaler contains lactose monohydrate). **Special warnings and Precautions:** Not for acute treatment of asthma attack, nor initiation in significantly or acutely deteriorating asthma. Advise patients to seek medical attention if symptoms deteriorate. Caution in patients with: Pulmonary infections e.g. TB, fungal, viral; severe cardiovascular disorders, heart rhythm abnormalities, diabetes mellitus, thyrotoxicosis and hypokalaemia. May cause cardiac arrhythmias, paradoxical bronchospasm post-dose, hyperglycaemia, β_2 agonist effects and pneumonia. Risk factors for pneumonia include current smoking, older age, low BMI and severe COPD. Systemic effects of inhaled corticosteroids may occur, particularly at high doses for prolonged periods, but much less likely than with oral steroids. Eye symptoms may be due to underlying serious conditions - consider referral to ophthalmologist. Cessation of and dose changes to steroids, transfer from oral steroids and stressful situations require caution. Regularly monitor height of children receiving prolonged treatment with ICS. The dose of ICS should be reduced to the lowest dose at which effective control of asthma is maintained. **Drug interactions:** Avoid betablockers in asthma. Potentially serious hypokalaemia may result from β_2 agonist therapy. Particular caution is advised in acute severe asthma as this effect may be potentiated by concomitant treatment with xanthine derivatives, steroids and diuretics. Avoid concomitant administration with potent and moderate CYP3A4 inhibitors unless benefits outweigh potential risk. **Pregnancy and lactation:** Experience limited. Balance risks against benefits. **Side effects:** *Very Common:* headache, nasopharyngitis. *Common:* oropharangeal candidiasis, pneumonia (in COPD), bronchitis, hypokalaemia, throat irritation, hoarseness/ dysphonia, sinusitis, contusions, muscle cramps, traumatic fractures, arthralgia, myalgia. *Serious other - uncommon:* hyperglycaemia, cataract, angina pectoris. *Rare:* oesophageal candidiasis, angioedema, respiratory symptoms (bronchospasm), anaphylaxis, Cushings syndrome, cushingoid features, adrenal suppression, growth retardation in children and adolescents, decreased bone mineral density, behavioural changes (predominantly in children), glaucoma, cardiac arrhythmias and paradoxical bronchospasm. *Not known:* depression or aggression (predominantly in children). *Paradoxical bronchospasm:* substitute alternative therapy. **Legal category:** POM. **Presentation and Basic NHS cost:** Accuhaler 60 inhalations. Seretide 100 - £17.46. Seretide 250 - £33.95. Seretide 500 - £32.74. Evohaler 120 inhalations. Seretide 50 - £17.46. Seretide 125 - £23.45. Seretide 250 - £29.32. **Product Licence (PL) nos:** 10949/0314-0316, 10949/0337-0339. **PL holder: Glaxo Wellcome UK Limited, trading as GlaxoSmithKline UK,** 980 Great West Road, Brentford, Middlesex TW8 9GS **Last revision:** January 2021 Content Lab Code: PI-5348. Seretide, Accuhaler and Evohaler are registered trademarks of the GlaxoSmithKline Group of Companies.

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SERETIDE

salmeterol/fluticasone propionate

References: 1. Bateman ED, *et al. Am J Respir Crit Care Med* 2004;170:836–844.

PM-GB-FPS-ADVT-210001 April 2021

WEDNESDAY 24 NOVEMBER 2021

07:30-18:00

POSTER VIEWING

All posters are available on demand throughout the three days in the Poster Hall, and should be viewed prior to joining the live poster sessions at the programmed times.

P1-P7

ILD: how big is the problem? How can you spot it and how should you monitor it?

Live discussion of these poster abstracts will take place from 10:45-11:45

P8-P17

Clinical developments in non-invasive ventilation and sleep

Live discussion of these poster abstracts will take place from 10:45-12:00

P18-P28

Virtual monitoring in COVID-19

Live discussion of these poster abstracts will take place from 14:00-15:25

P29-P41

Advances in the management of TB and NTM infections

Live discussion of these poster abstracts will take place from 14:00-15:40

P42-P55

Diagnostics and monitoring of asthma and co-morbidities

Live discussion of these poster abstracts will take place from 14:00-15:45

08:00-08:30

BTS JOURNAL CLUB

VASCULITIS AND LUNG DISEASE

Dr Janice Harper (Liverpool)

Learning objectives:

Eosinophilic granulomatosis with polyangiitis (EGPA) is a subset of ANCA associated vasculitis with two distinct subtypes. Differences in pathophysiology and airway autoimmunity, clinical features and response to treatment (anti-IL5 and anti-B cell) will be discussed.

08:30-10:30

SYMPOSIUM

JOINT BTS/BALR SYMPOSIUM PART 1

FIGHTING THE FIRE IN AIRWAY INFLAMMATION AND BACTERIAL COLONISATION

SCIENTIFIC PROGRAMME

Chaired by: Dr Bettina Schock (Belfast) and Dr Amanda Tatler (Nottingham)

08:30 Inflammation and cilia: a hairy situation

Dr Amelia Shoemark (Dundee)

09:10 AMPlifying host defence: innate control of respiratory infections

Professor Pieter Hiemstra (Leiden)

09:50 Circadian rhythm and lung inflammation: right place at the wrong time

Dr Julie Gibbs (Manchester)

Learning objectives

1) Gain understanding of innate barrier defences in the lung, and cutting-edge scientific approaches to characterise ciliary defects in the context of bronchiectasis.

2) In the age of antimicrobial resistance, discover the key role of the antimicrobial peptides naturally produced within the airway, and how they are modulated in health and disease.

3) Develop awareness of how circadian rhythm – our biological clock – can modulate the immune system, inflammation and steroid responsiveness in the lung.

08:45-10:05

SPOKEN SESSION: S1 – S5

The clinical management of acute asthma

Chaired by: Mrs Jemma Haines (Manchester) and Mrs Leanne Jo Holmes (Manchester)

08:50 **S1**

Obese, non-eosinophilic asthma: frequent exacerbators in a real-world setting

S Ananth, A Navarra, R Vancheeswaran

09:05 **S2**

Derivation of a prototype asthma attack risk scale centred on blood eosinophils and exhaled nitric oxide

S Couillard, A Laugerud, M Jabeen, S Ramakrishnan, J Melhorn, TSC Hinks, ID Pavord

09:20 **S3**

Emergency room visits and rescue medication use in patients with asthma in the IRIDIUM study and their impact on carbon footprint

KM Beeh, RN van Zyl-Smit, K Mezzi, S Aumônier, A Pethe, P D'Andrea, A Woodcock

WEDNESDAY 24 NOVEMBER 2021

09:35 **S4**

Asthma in the emergency department. Outcome from specialist nurse intervention

E Sadler, F Rands, S Hanson, M Doherty

09:50 **S5**

Mortality analyses on systemic corticosteroid use: a long-term observational study

X Xu, TN Tran, S Golam, V Carter, DB Price

08:45-10:05
SPOKEN SESSION: S6 – S10

Stay awake! It's an update on sleep

Chaired by: Dr Sonya Craig (Liverpool) and Dr Shyam Madathil (Birmingham)

08:50 **S6**

COVID-19 related changes in outpatient CPAP set-up pathways for OSA are linked with decreased 30-day CPAP usage

CD Turnbull, M Allen, J Appleby, R Brown, N Bryan, A Cooper, B Cooper, J Davidson, H Farley, A Gaspar, G Gibbons, C Gillooly, B Gray, G Hill, A Kendrick, B Marsh, A McMillan, J Page, J Pepperell, T Quinnell, C Rogers, J Sexton, N Shepherd, J Steier, J Stockley, J Stradling, S West, A Woroszyl, S Wright, A Nickol

09:05 **S7**

Estimating the potential impact of residual EDS on the QoL of patients with OSA and, for the first time, their partners, using a time trade-off methodology

K Tolley, S Mettam, J Noble-Longster, R Hibbs, L Stainer, M Cawson, T Snell, A Manuel

09:20 **S8**

The impact of artefact-free recording time on the diagnosis of sleep disordered breathing

AT Knowles, H Gajaweera, J Gavlak, CM Hill, M Stibalova, HM Yuen, HJ Evans

09:35 **S9**

The management of sleep disordered breathing in people living with HIV

A Saigal, A Jaffer, AJ Shah, SK Mansell, E Pickett, C Smith, R Rakhit, M Johnson, M Lipman, S Mandal

09:50 **S10**

AHI does not adequately reflect OSA severity

E Lombard, S Merritt

08:45-10:05
SPOKEN SESSION: S11 – S15

Probing the pleural space

Chaired by: Professor Kevin Blyth (Glasgow) and Dr Deepan Sivakumar (London)

08:50 **S11**

Metabolomic Assessment of Pleural Effusions (MAPLE)

K Love, H Welch, R Bhatnagar, A Morley, A Medford, L Muir, N Maskell

09:05 **S12**

PAI-1 is the predominant biological factor associated with septation formation in pleural infection

EO Bedawi, N Kanellakis, Y Zhao, A Sundaralingam, D Addala, M Ellayeh, R Hallifax, JP Corcoran, AM Condliffe, NM Rahman

09:20 **S13**

Antibiotic penetration into the infected pleural space; a PK/PD study

DT Arnold, L Read, A Noel, FW Hamilton, A MacGowan, M Bayliss, NA Maskell

09:35 **S14**

Length of antibiotic course for treating pleural infection: a randomised trial

M Hassan, M Gadallah, B El-Shaarawy, A El-Shazly, AS Sadaka

09:50 **S15**

Evolution of mesothelioma following initial biopsies showing benign pleural inflammation: a meta-analysis

KJ Ferguson, KG Blyth, M Neilson

08:45-09:50
SPOKEN SESSION: S16 – S19

Predictive tools for acute deterioration in COVID-19 and beyond

Chaired by: Dr Chloe Bloom (London) and Dr Luke Hodgson (Southampton)

WEDNESDAY 24 NOVEMBER 2021

08:50 **S16***

Prognostication in hospital acquired pneumonia – are current scoring systems fit for purpose?

A Adiga, F Grudzinska, D Dosanjh, D Parekh

09:05 **S17**

Dynamic Early Warning Score versus National Early Warning Score-2 for predicting clinical deterioration in respiratory patients

S Gonem, A Taylor, G Figueredo, S Forster, T McKeever, J Garibaldi, D Shaw

09:20 **S18**

Investigating the impact of influenza activity on excess mortality rates from cardiovascular, respiratory and renal diseases in Ireland during the 2010/11–2019/20 influenza seasons

JX Choo, J Harbison

09:35 **S19**

Relevance of prediction scores derived from the SARS-CoV-2 first wave, in the UK COVID-19 second wave, for early discharge, severity and mortality: a PREDICT COVID UK prospective observational cohort study

H Ghani, A Navarra, E Croft, H Nur, M Prabhakar, A Azri Yahaya, I Darwish, D Longe, HL Lee, R Vancheeswaran

***S16 – BTS Medical Student Awards – Highly Commended**

08:45-10:15
SYMPOSIUM

TRANSLATION OF SCIENTIFIC ADVANCES INTO PATIENT BENEFIT

Chaired by: Dr Ahsan Akram (Edinburgh) and Dr Emma O'Dowd (Nottingham)

08:45 Importance and therapeutic implications of tumour heterogeneity in the clinical setting

Dr Mariam Jamal-Hanjani (London)

09:15 Vaccines for lung cancer: bench to bedside

Professor Benoit Van Den Eynde (Oxford)

09:45 Clinical trial designs in the personalised therapy era

Professor Gary Middleton (Birmingham)

SCIENTIFIC PROGRAMME

Learning objectives

1) Understanding the importance of genomic heterogeneity within clinical settings.

2) Potential impact of vaccine therapies as strategies to harness IO.

3) Understanding how advanced trial designs are needed in the era of personalised medicine.

08:45-10:15
SYMPOSIUM

MOVING ON IN PULMONARY REHABILITATION AFTER COVID-19

Chairs: Laura Graham (London) and Professor Sally Singh (Leicester)

08:45 Intermittent exercise training in severe lung disease: evidence and clinical application

Professor Ioannis Vogiatzis (Northumbria)

09:15 Post COVID-19 rehabilitation: what's the evidence?

Professor Sally Singh (Leicester)

09:45 Can ambulatory oxygen therapy improve performance in patients with chronic lung disease?

Dr Samantha Kon (London)

Learning objectives

1) To understand the clinical impact of intermittent exercise training in severe lung disease.

2) To discuss the evidence around post COVID-19 rehabilitation.

3) To discuss the role of ambulatory oxygen in improving outcomes for those with chronic lung disease.

10:30-10:40
BTS NEWS BROADCAST

LIVE DAILY PREVIEW

A live round-up of highlights in today's programme, as well as a look at trending Tweets! #BTSWinter2021

10:45-11:45
POSTER DISCUSSION: P1 – P7

ILD: how big is the problem? How can you spot it and how should you monitor it?

Chaired by: Professor Michael Gibbons (Exeter) and Dr Katherine Myall (London)

P1 Global overview of incidence and prevalence of interstitial lung disease: a systematic literature review

R Gupta, A Koteci, A Morgan, PM George, JK Quint

P2 Geographical variation of interstitial lung disease in the Northern Trust

M Donaghy, S Gilmour, E Murtagh, P Minnis

P3 Progression of early fibrotic ILA to established interstitial lung disease and mortality: observations from a regional centre

A Achaiah, P Lyon, E Fraser, P Saunders, R Hoyles, R Benamore, LP Ho

P4 Lung cancer screening provides a unique opportunity for early diagnosis and management of interstitial lung diseases

RJ Hewitt, EC Bartlett, R Ganatra, H Butt, J Morjaria, V Kouranos, F Chua, M Kokosi, PL Molyneaux, SR Desai, AU Wells, RG Jenkins, EA Renzoni, S Kemp, A Devaraj, PM George

P5 How should patients with interstitial lung abnormalities be evaluated and monitored? Experience from a secondary care interstitial lung disease clinic

SL Liew, J Shaw, C Hayton, Z Borrill, G Ng Man Kwong

P6 Telehealth for patients with interstitial lung diseases (ILD): results of an international survey of clinicians

M Althobiani, J Hurst, A Russell, J Porter

P7 Remote frailty assessment and prevalence of frailty in older outpatients with idiopathic pulmonary fibrosis

G Vekaria, A Alhaffar, A Abdi, R Dattani, K Ward, M Dani, R Coker

10:45-12:00

POSTER DISCUSSION: P8 – P17

Clinical developments in non-invasive ventilation and sleep

Chaired by: Ms Verity Ford (Lancashire) and Dr Swapna Mandal (London)

P8 A retrospective cohort study of idiopathic diaphragmatic palsy: a diagnostic triad, natural history and prognosis

S Nafisa, B Messer, B Downie, P Ehilawa, W Kinnear, S Algendy, M Sovani

P9 Developing an intrasalivary botox service for patients receiving long-term ventilation (LTV) at home: a single centre experience

JM Harbottle, T Doris, HMI Tedd, A De Soyza, B Messer

P10 Exploring information needs of patients with severe chronic obstructive pulmonary disease requiring home non-invasive ventilation

J Rodger, HM Tedd, J Mair, A De Soyza, K Hester

P11 A survey of COPD patients self-reported sleep problems

K George, D Roe, S West

P12 Implementation of a computer guided sleep consultation with an initial technician review allows early characterisation and prioritisation of patients for management

M Brady, B Chakrabarti, M Ahmad, S Craig, M Thomas, MG Pearson, J Wood, L Reed, E McKnight, P England, RM Angus

P13 Symptoms predictive of sleep disordered breathing in post-polio syndrome

MCF Cheng, A Curtis, JS Lee, A Piper, G Kaltsakas, S Shaw, N Hart, J Steier

P14 The role of a Ventilation Multidisciplinary Team meeting (VMDT) in optimising critical care resource-use

A Balu, A Watson, L Linhartova, P Ellis, A Cartwright, R Mukherjee

P15 The impact of COVID-19 on response times for acute non-invasive ventilation set-ups

A Watson, H Barnard, P Antoine-Pitterson, B Jones, A Turner, R Mukherjee

P16 Effect of humidifier temperature during high flow nasal therapy on concurrent aerosol drug delivery with a vibrating mesh nebuliser

B Murphy, O O'Sullivan, G Bennett, E Fernandez Fernandez, R MacLoughlin

P17 Characteristics and outcomes of patients with spinal cord injury requiring mechanical ventilation at a specialist ventilation centre, 2010-2019

SK Shrimanker, NM Shah, M Freeman, RF D'Cruz, G Kaltsakas, P Marino, H Pattani, MC Ramsay, S Srivastava, J Steier, N Hart, PB Murphy, ES Suh

WEDNESDAY 24 NOVEMBER 2021

10:45-12:15
SYMPOSIUM

JOINT BTS/BPRS SYMPOSIUM THE CHILD IS FATHER OF THE MAN

Chaired by: Professor Charlotte Bolton (Nottingham) and Monica Fletcher (Edinburgh)

10:45 Air pollution and asthma: the effect of the new legal ruling

Professor Jonathan Grigg (London)

11:15 Poor nutrition: destroyer of the developing lung

Dr Ian Sinha (Liverpool)

11:45 Where next for our children's lungs post COVID-19?

Professor Monica Lakhanpaul (London)

Learning objectives

1) To understand the major public health concerns in paediatric respiratory medicine globally.

2) To appreciate the impacts of intersections e.g., poverty, second-hand tobacco smoke, environmental pollution.

3) To increase awareness of public health initiatives and political drivers in these areas, particularly during the sharp focus of the COVID-19 pandemic.

10:45-12:20
SPOKEN SESSION: S20 – S25

The new normal? Novel and remote strategies for pulmonary rehabilitation

Chaired by: Dr Claire Nolan (London) and Dr Owen Tomlinson (Exeter)

10:50 **S20**

Combining physical activity behavioural modification strategies alongside cognitive behavioural therapy during pulmonary rehabilitation in patients with COPD: an interim analysis of a pilot RCT

M Armstrong, E Hume, L McNeillie, F Chambers, L Wakenshaw, G Burns, K Heslop-Marshall, I Vogiatzis

11:05 **S21**

Feasibility of smartphone-based physical activity tele-coaching in lung transplant recipients

E Hume, H Muse, K Wallace, M Wilkinson, K Heslop-Marshall, A Nair, J Sanchez, J Benavent, J Roldan, S Clark, I Vogiatzis

11:20 **S22**

Evaluation of a virtual pulmonary rehabilitation programme and comparison to traditional face-to-face programmes in COPD

K Cox, A Krynicka, AR Jenkins, AW Jones

11:35 **S23**

Integrating home-based exercise training within a hospital at home service for patients hospitalised with acute exacerbations of COPD: a mixed methods feasibility study

RE Barker, LJ Brighton, J Bayly, JA Walsh, CM Nolan, S Patel, O Polgar, J Wenneberg, SSC Kon, JA Wedzicha, M Maddocks, M Farquhar, WDC Man

11:50 **S24**

Is a novel digital breathing and energy management programme effective in reducing symptoms of long COVID?

J Moore, J Plumbe, N Hilliard, K Plumbe, N Beckett, T Burch, K Bahadur

12:05 **S25**

Cardiopulmonary exercise testing to evaluate exercise limitation and shortness of breath in long COVID

L Godinho, A Freeman

10:45-12:20
SPOKEN SESSION: S26 – S31

COPD exacerbations: prevention, treatment, recovery

Chaired by: Professor Mona Bafadhel (Oxford) and Dr Neil Greening (Leicester)

10:50 **S26**

Effect of single-inhaler extrafine beclometasone/formoterol/glycopyrronium pMDI (BDP/FF/GB) compared with two-inhaler fluticasone furoate/vilanterol DPI + tiotropium DPI (FLF/VIL+TIO) triple therapy on health-related quality of life (HRQoL) in patients with COPD: the TRISTAR study

M Kots, G Georges, A Guasconi, C Vogelmeier

11:05 **S27**

Are patients with COPD more adherent to fluticasone furoate/umeclidinium/vilanterol (FF/UMEC/VI) compared with multiple-inhaler triple therapy in a real-world UK primary care treated population?

DMG Halpin, KJ Rothnie, V Banks, A Czira, C Compton, R Wood, T Tritton, O Massey, R Wild, N Snowise, E Gubba, R Sharma, AS Ismaila, CF Vogelmeier

11:20 **S28**

Home humidified high-flow therapy following severe exacerbation of COPD: a mixed-methods feasibility randomised control trial

RF D'Cruz, A Rossel, ES Suh, G Kaltsakas, NM Shah, A Douiri, L Rose, PB Murphy, N Hart

11:35 **S29**

Physical activity and sleep quality as related to patient-reported outcomes and physiology during recovery from severe COPD exacerbation

RF D'Cruz, ES Suh, M Patout, G Kaltsakas, NM Shah, R Priori, A Douiri, J Moxham, N Hart, PB Murphy

11:50 **S30**

Predicting hospital length of stay for acute admissions in patients with COPD

G Cox, S Burns, A Taylor, P McGinness, DJ Lowe, C Carlin

12:05 **S31**

Home oxygen therapy and smoking: playing with fire?

TS FitzMaurice, C Jager, M Simmons, D Barber, D Wat

11:00-13:00
SYMPOSIUM

JOINT BTS/BALR SYMPOSIUM PART 2 NOVEL APPROACHES TO EXTINGUISHING LUNG DYSBIOSIS

Chaired by: Dr Kylie Belchamber (Birmingham) and Dr Alison John (Nottingham)

11:00 Pneumonia prevention using genetically-engineered live attenuated *Streptococcus pneumoniae*

Professor Jeremy Brown (London)

11:40 Exploiting commensal bacteria to enhance respiratory resilience to pathogenic colonisation

Professor Mirco Schmolke (Geneva)

12:20 Harnessing natural predation using phage therapy

Dr Helen Spencer (London)

Learning objectives

1) Gain an appreciation of the basic science and pre-clinical testing required in the development of novel vaccination approaches against bacterial pneumonia.

2) Further understand the key role played by (and manipulation of) lung commensals in the protection against bacterial colonisation.

3) In the face of increasing anti-microbial resistance, evaluate the potential of utilising tailored bacteriophage therapy to target key respiratory pathogens such as Pseudomonas.

13:00-13:45
GUEST LECTURE

THE BTS SCIENTIFIC LECTURE THE GLOBAL CHALLENGE OF AGEING

Professor Dame Linda Partridge (London/Cologne)

Introduced by: Dr Graham Burns (Newcastle upon Tyne)

Learning objectives

To learn about why we age, and what is healthy and unhealthy ageing. To consider the links between ageing and chronic disease and multi-morbidity, and consider novel ways to improve health with longevity.

13:45-14:00
BTS NEWS BROADCAST

INTERVIEW TIME

Professor Elizabeth Sapey, Chair of the BTS Science and Research Committee, in conversation with the in-coming BTS Chair, Dr Paul Walker.

14:00-15:25
POSTER DISCUSSION: P18 – P28

Virtual monitoring in COVID-19

Chaired by: Ms Rebecca Livingstone (London) and Dr Tom Ward (Leicester)

P18 Safety and effectiveness of an integrated, telehealth-led supported discharge service for COVID-19

A Shaw, M Moodley, K McSporran, C Thornley, H Chiles, V Smith, K Moore, L Taylor, P Patel, T Adam, H Beenick, S Harman, S Lea, A Woodward, Z Harris, N Patel, S Ghosh, AC Murphy, I Valero-Sanchez

P19 COVID virtual ward and emergency department discharges: clinical outcomes and recommendations following COVID pandemic phase 2

ER Bradley, HJ Petty, J Brackston, W Khan, SO Brij

P20 COVID supported discharge: a Liverpool experience

L Humphreys, A Galvez Gonzalez, M Hammond, S Jones, J Hadcroft, G Brocklehurst

P21 Development of a COVID-19 virtual ward to facilitate early discharge from hospital for patients with an on-going oxygen requirement

LA Boast, GE Lowrey, RE Aldridge, K Hall, R Evans, D Subramanian

P22 Early supported discharge with Domiciliary Oxygen and Integrated Respiratory Team (DO-IRT) care for hospitalised SARS-CoV2 patients

MS Johnson, LH Edis, EM McElhinney, V Meyrick, LJ Smith, PSP Cho, IS Patel

P23 Implementing a daily virtual COVID-19 multi-disciplinary team meeting in secondary care

JA Wingfield Digby, H Petty, S Brij, J Bright, K Irion, W Khan

P24 COVID-19 Advanced Respiratory Physiology (CARP) wearable respiratory monitoring: early insights

SBH Lua, D Lowe, A Taylor, M Sim, B Henderson, C Trueman, O Meredith, S Burns, P McGuinness, C Carlin

P25 The effect of post COVID-19 rehabilitation on health status using the EQ-5D-5L

T Williamson, F Dyer, D Garvey, A Miers, C Morris, C Wells, S Rahman

P26 Knowledge seeking behaviour of the COVID-19 population. Analysis of the first million UK users of Your COVID Recovery®

RE Barclay, N Gardiner, E Chaplin, A Watt, G Mills, M Baldwin, K Hicklin, SJ Singh

P27 The need for rehabilitation programme after an episode of COVID-19

M Alhotye, E Daynes, C Gerlis, SJ Singh

P28 Developing a novel advanced clinical practitioner led severe COVID-19 follow-up service – a picture is not always worth a thousand words

T Armstrong, R Gillott, T Bongers, A Ashraf

14:00-15:30
SYMPOSIUM

COPD: SCALING NEW HEIGHTS

Chaired by: Professor Charlotte Bolton (Nottingham) and Professor Tom Wilkinson (Southampton)

14:00 Inequalities: the silent killer

Professor Nadia Hansel (Baltimore)

14:30 Exacerbations: zero tolerance

Professor John Hurst (London)

15:00 Endobronchial intervention: right person for the right approach

Professor Nicholas Hopkinson (London)

Learning objectives

1) To highlight the influence of these factors on the detection, management and diagnosis of COPD.

2) A focus on the first exacerbation, what can we do to emphasise this event and prevent future. What options are there? What are the latest interventions? The patient perspective. The need to address this in research and not settle for repeated exacerbation.

3) That the long-term plan encompasses a lot of COPD care and is vital but there is still a need to identify certain treatments for certain patients like LVR. We should not be denying patients access to these. Discussion that LVR would be good to be highlighted, especially with plans for commissioning coming in.

14:00-15:30
SYMPOSIUM: T1 – T6

BTS/BALR/AUK-BLF EARLY CAREER INVESTIGATOR AWARDS

Chaired by: Rachael Moses (London)

Judged by: Professor James Chalmers (Dundee), Professor Elizabeth Sapey (Birmingham) and Dr Chris Scotton (Exeter)

14:00 **T1**

The local and systemic response to SARS-CoV-2 infection in children and adults

KB Worlock, M Yoshida, RGH Lindeboom, N Huang, CR Butler, N Kumasaka, C Dominguez Conde, L Mamanova, L Bolt, L Richardson, K Polanski, E Madissoon, JL Barnes, J Allen-Hyttinen, E Kilich, BC Jones, A de Wilton, A Wilbrey-Clark, W Sungnak, JP Pett, E Prigmore, H Yung, P Mehta, A Saleh, A Saigal, V Chu, JM Cohen, C Cane, A Iordanidou, S Shibuya, AK Reuschl, AC Argento, RG Wunderink, SB Smith, TA Poor, CA Gao, JE Dematte, NU SCRIPT Study Investigators, G Reynolds, M Haniffa, GS Bowyer, M Coates, MR Clatworthy, FJ Calero-Nieto, B Göttgens, C O'Callaghan, NJ Sebire, C Jolly, P de Coppi, CM Smith, AV Misharin, SM Janes, SA Teichmann, KB Meyer, MZ Nikolić

14:15 **T2**

Cluster analysis of transcriptomic datasets to identify endotypes of idiopathic pulmonary fibrosis

LM Kraven, AR Taylor, PL Molyneaux, TM Maher, AJ Yeo, WA Fahy, RG Jenkins, LV Wain

14:30 **T3**

Integrated transcriptomic analysis of human tuberculosis granulomas and a biomimetic model identifies sphingosine kinase 1 as a potential therapeutic target

MT Reichmann, LB Tezera, AF Vallejo, M Vukmirovic, R Xiao, S Jogai, S Wilson, BG Marshall, MG Jones, A Leslie, J D'Armiento, N Kaminski, ME Polak, PT Elkington

14:45 **T4**

Reinfection with influenza A virus leads to rapid changes in immunomodulatory molecules and inflammatory subtypes of lung fibroblasts and epithelial cells

JC Worrell, G Finney, KE Hargrave, C Hansell, J Singh Nijjar, F Morton, J Cole, MKL MacLeod

15:00 **T5**

Respiratory particle and droplet emission during speech and exercise

CM Orton, HE Symons, B Moseley, J Archer, NA Watson, KEJ Philip, B Saccente-Kennedy, DAE Costello, WJ Browne, JD Calder, BR Bzdek, JH Hull, JP Reid, PL Shah

15:15 **T6**

Therapeutically targeting PTBP1/PKM2-driven glycolysis in endothelial cells: a novel approach to treat pulmonary arterial hypertension

I Cuthbertson, R Sutcliffe, NW Morrell, P Caruso

14:00-15:30

SYMPOSIUM

UPDATES IN THE PATHOGENESIS, PROGNOSIS AND TREATMENT OF ILD

Chaired by: Dr Mark Jones (Southampton) and Dr Lisa Nicol (Edinburgh)

14:00 Integrative analysis of cell state changes in lung fibrosis with peripheral protein biomarkers

Dr Herbert Schiller (Munich)

14:30 Racial differences in IPF

Dr Ayodeji Adegunsoye (Chicago)

15:00 Acute exacerbations of ILD

Dr Tamera Corte (Sydney)

Learning objectives

1) Understanding the Lung Cell Atlas and its impact for health and pulmonary fibrosis.

2) To understand the racial differences in age at diagnosis and survival in patients with pulmonary fibrosis.

3) An update in our understanding and management of acute exacerbations of interstitial lung disease.

14:00-15:40

POSTER DISCUSSION: P29 – P41

Advances in the management of TB and NTM infections

Chaired by: Professor Marc Lipman (London) and Dr Jennifer Honda (Denver)

P29 How are we managing non-tuberculous mycobacteria pulmonary disease (NTM-PD)? Results from the first UK-wide survey of clinical practice

AM Malhotra, S Bryant, M King, H Kunst, CS Haworth, M Lipman

P30 Mobile health uses in surveillance of tuberculosis medication side effects and beyond – a pilot study

O Dytko, M Park, R Nicholas, R Akshikar, OM Kon

P31 Characteristics associated with treatment decisions and outcomes in non-tuberculous mycobacterial pulmonary disease: a retrospective cohort study

V Shivji, L Whitmore, N Shah, I Cropley, D Creer, A Jaffer, D Lowe, R Moores, J Brown, M Lipman

P32 Cutaneous adverse drug reactions to anti-tuberculosis therapy – an issue for fixed-dose combination treatments?

E McCormick, J Barrett, J Brown, C Campbell, D Creer, I Cropley, D Lowe, R Moores, M Lipman

P33 A retrospective review of the investigation into patients with positive cultures for non-tuberculous mycobacteria (NTM). Just how much work is it?

K Pates, M Ogedengbe, R Enuechie, J Nwagwu, M Kanu, C Mazhude, L Baker

P34 5-year experience of latent tuberculosis Infection (LTBI) management pre-immunomodulatory therapy at a tertiary hospital infectious diseases unit in the UK

S Colley, N Laundy, A Vedio, DB Cohen, PJ Collini

P35 Neck node TB: perspective from the Rapid Access Head and Neck Clinic

R Noonan, M Walker, S Burns, D Rana, N Mani, SO Brij

P36 Screening for blood-borne viruses and vitamin D deficiency in patients with active and latent mycobacterium tuberculosis (TB) infection in the UK: a longitudinal cohort study

HM Chen, F Rabbani, N Clerk, K Young, E Lunn, S Kalam, G Antunes

P37 Managing non tuberculous mycobacterial pulmonary disease – missed opportunities?

Y Maung Maung Myint, A Jacob, S Ananth, C Stavropoulos, A Hawkins, M Vidwans, P Nandasiri, A Jayaratnam

P38 A retrospective review of treatment outcomes, morbidity and mortality in patients treated for non-tuberculous mycobacterial (NTM) infection

K Pates, M Ogedengbe, R Enuechie, J Nwagwu, M Kanu, Y O'Neill, L Dennard, L Baker

P39 Can advances in molecular methods improve the management and outcomes of Non-Tuberculous Mycobacterial Lung Disease (NTM-LD)? A service evaluation of laboratory and clinical management of NTM-LD in a large teaching hospital in England

J Carter, HP McGann, B Hawramy, F McGill

P40 Is routine liver function testing necessary for patients receiving latent tuberculosis treatment?

S Christie, J Potter

P41 Pseudomonas aeruginosa: burden, treatment and outcomes in a long-term ventilation service

HJ Carlin, RE Sobala, TB Fretwell, S Shakir, K Cattermole, P McCallion, A Royston, J Davison, J Lumb, H Tedd, B Messer, A De Soyza

14:00-15:45

POSTER DISCUSSION: P42 – P55

Diagnostics and monitoring of asthma and co-morbidities

Chaired by: Dr Robin Gore (Cambridge) and Dr Kathryn Prior (Preston)

P42 Asthma treatment adherence checks: present and future

N Stewart-Kelcher, A Patel, S Rahman, A Hearn, C Roxas, L Green, L Thomson, M Fernandes, AM Nanzer, DJ Jackson, J Dhariwal, G d'Ancona

P43 Experiences of asthma in the UK-resident adult South Asian population: a qualitative study

ZK Yusuf, D Wensley, H Owton, SJ Singh, JAC Allen Collinson

P44 The impact of lack of proficiency in English on asthma control

LM Jones, R Lawson, G Hellens, C Cameron, M Snowden

P45 Associations between employment and socio-demographic and health-related factors, in patients with severe asthma

GI Walters, J Marsh, A Bahron, MT Krishna, AH Mansur

P46 Does asthma during pregnancy actually follow the 'one-third' rule?

AJ Smith, W Khan

P47 A pilot study for an asthma in pregnancy service within a UK tertiary centre

ER Bradley, HJ Petty, LC Tomlinson, SJ Paterson, SO Brij, BD Al-Sheklly, WA Khan

P48 Long-term efficacy of Dupilumab in patients with moderate-to-severe asthma in the LIBERTY ASTHMA TRAVERSE open-label extension study: improvements in asthma control and health-related quality of life

ID Pavord, ME Wechsler, LB Ford, JF Maspero, D Langton, C Domingo, A Papi, A Bourdin, H Watz, X Mao, N Amin, M Hardin, Y Zhang, AH Khan

P49 Bone protection for patients with asthma – a service evaluation

BL Johnson, H Durrington

P50 Use of accelerometers to compare physical activity levels in participants with asthma grouped by body mass index and asthma severity

HC Ricketts, R Chaudhuri, F Steffensen, JS Baker, DS Buchan, DC Cowan

P51 Spot the difference? Comparison of clinical characteristics of patients with Inducible Laryngeal Obstruction (ILO) and asthma referred to a severe asthma and airways tertiary centre

C Slinger, R Slinger, K Prior, A Vyas, P Mannion

P52 A systematic review of the effectiveness of existing non-pharmacological interventions used to treat adults with inducible laryngeal obstruction

J Haines, JA Wingfield Digby, J King, JA Smith, SJ Fowler

P53 Combined exposure to vapors, gases, dusts, fumes and tobacco smoke increases the risk of asthma symptoms especially in adult-diagnosed asthma

H Hisinger-Mölkänen, P Piirila, A Sovijarvi, L Tuomisto, H Andersen, A Lindqvist, H Backman, A Langhammer, E Rönmark, B Lundback, P Ilmarinen, H Kankaanranta, P Pallasaho

P54 Combined exposure to vapors, gases, dusts, fumes and tobacco smoke increases the risk of asthma symptoms

H Hisinger-Molkanen, P Pallasaho, A Sovijarvi, L Tuomisto, H Andersen, A Lindqvist, H Backman, A Langhammer, E Ronmark, B Lundback, P Ilmarinen, H Kankaanranta, P Piirila

P55 Occupations, workplace exposures and physical demands of work in patients with severe asthma

GI Walters, F Rezai, N Le Moual, J Marsh, A Bahron, MT Krishna, AH Mansur

WEDNESDAY 24 NOVEMBER 2021

16:00-16:15
GUEST LECTURE
BTS AWARDS PRESENTATIONS

Presentation of the BTS Medal and BTS Awards for Meritorious Service

16:15-17:00
GUEST LECTURE
THE BTS PRESIDENT'S ADDRESS
THE CHANGING FACES OF RESPIRATORY MEDICINE

Rachael Moses (London)

Introduced by: Dr Graham Burns (Newcastle upon Tyne)

17:15-17:45
BTS NEWS BROADCAST
TWILIGHT HIGHLIGHTS

A live, entertaining discussion and review of the day's sessions, and highlights not to miss on demand after the Meeting ends.

THURSDAY 25 NOVEMBER 2021

07:30-18:00
POSTER VIEWING

All posters are available on demand throughout the three days in the Poster Hall, and should be viewed prior to joining the live poster sessions at the programmed times.

P56-P61
Cough: is it a problem and what can we do about it?
Live discussion of these poster abstracts will take place from 11:00-11:50

P62-P72
Breaking barriers in pulmonary rehabilitation and physiotherapy
Live discussion of these poster abstracts will take place from 11:00-12:25

P73-P78
Virtually perfect: remote medicine and digital health
Live discussion of these poster abstracts will take place from 14:00-14:50

P79-P85
The real-world care of COPD patients
Live discussion of these poster abstracts will take place from 14:00-15:00

THURSDAY 25 NOVEMBER 2021

P86-P97
COVID-19: clinical features and risk

Live discussion of these poster abstracts will take place from 14:00-15:30

P99-P112
The wider impact of the pandemic

Live discussion of these poster abstracts will take place from 14:00-15:45

8.00am – 8.30am
BTS JOURNAL CLUB

"HOT OFF THE PRESS" CLINICAL TRIALS

Dr Philip Molyneaux (London)

Learning objectives:

To discuss the trials and tribulations of 2021.

08:30-10:00
SYMPOSIUM

YEAR OF THE NURSE: A SPOTLIGHT ON NURSE RESEARCH LEADERSHIP

Chaired by: Alison Hughes (Chair, ARNS) and Carol Stonham (Chair, PCRS)

08:30 The support needs of patients with COPD and their carers
Professor Morag Farquhar (Norwich)

08:55 Personalised approaches to asthma treatment
Professor Vanessa McDonald (Newcastle, Australia)

09:20 Reducing admissions by providing nurse led psychological support
Dr Karen Heslop-Marshall (Newcastle upon Tyne)

09:45 Panel discussion

Learning objectives

1) Understand the support needs of COPD patients and their carers.

2) To understand personalising approaches to asthma management.

3) To discuss the impact of providing psychological support to patients.

4) To discuss the pathways for nurses to be more involved in leading research.

SCIENTIFIC PROGRAMME

08:30-10:00
SYMPOSIUM

JOINT BTS/BPRS SYMPOSIUM
INTERSTITIAL LUNG DISEASE ACROSS THE DEVELOPMENTAL DIVIDE

Chaired by: Dr Nazia Chaudhuri (Manchester) and Dr Priti Kenia (Birmingham)

08:30 ChILD: what adult physicians can learn from paediatricians
Dr Rishi Pabary (London)

09:00 ILD: what paediatricians can learn from adult physicians
Professor Martina Vasakova (Prague)

09:30 ILD genetics: pearls and pitfalls
Dr Tessa Homfray (London)

Learning objectives

1) To gain a full understanding of the breadth of ILD in childhood and adult life.

2) To appreciate differences and similarities of ILD across the age spectrum.

3) To be brought up to date on advances in genetic and molecular diagnosis.

08:30-10:30
SYMPOSIUM

CHRONIC RESPIRATORY DISEASE IN LOW-INCOME AND MIDDLE-INCOME COUNTRIES (LMICs): FROM CHALLENGES TO SOLUTIONS

Chaired by: Dr Jamilah Meghji (Liverpool) and Professor Kevin Mortimer (Liverpool)

08:30 Challenges to the delivery of care for people with chronic respiratory disease in LMICs: a perspective from Malaysia
Professor Khoo Fe Ming (Malaysia)

09:00 Opportunities to improve care for people with chronic respiratory disease: perspectives from Malawi and Kenya
Dr Stephen Mulupi (Liverpool)

09:30 When it's not TB – bronchiectasis and post TB lung disease in LMICs
Dr Shami Jayasooria (Sheffield)

10:00 The WHO's CRD strategy for chronic respiratory disease in LMICs

Dr Sarah Rylance (WHO Respiratory Director)

Learning objectives

1) To give an up-to-date perspective on CRDs in LMICs building on a review published in The Lancet on this topic with authorship from the BTS GHG.

2) To give the new WHO Medical Officer for non-communicable respiratory disease an opportunity to engage with the BTS membership and GHG and to explore opportunities for collaborative working.

3) To inspire BTS members to get involved with work to address global respiratory health through Global Health Group initiatives.

08:45-10:05
SPOKEN SESSION: S32 – S36

Treatment and adherence in asthma

Chaired by: Professor Rekha Chaudhuri (Glasgow) and Professor Stephen Fowler (Manchester)

08:50 **S32**

Combination fixed-dose beta agonist and steroid inhaler as required for adults or children with mild asthma: a Cochrane systematic review

A Fries, I Crossingham, S Turner, S Ramakrishnan, M Gowell, F Yasmin, R Richardson, P Webb, E O'Boyle, T Hinks

09:05 **S33**

A pragmatic, randomised controlled trial of a tailored pulmonary rehabilitation package in difficult-to-control asthma associated with elevated body mass index

HC Ricketts, V Sharma, F Steffensen, A Goodfellow, E MacKay, G MacDonald, D Buchan, R Chaudhuri, DC Cowan,

09:20 **S34**

A multi-disciplinary approach ensuring successful transition from paediatric to adult asthma care – a focus on treatment adherence

N Stewart-Kelcher, G d'Ancona, A Hearn, L Thomson, M Fernandes, C Roxas, R Iles, A Gupta, J Dhariwal, DJ Jackson, AM Nanzer

09:35 **S35**

Creating behavioural personas to drive better design in health technology for asthma self-management

A Fallas, A Cumella, A Whittamore, B West, C Cheung, J Shopland, A Herbec, C Stefanidou, L Porter, N Gold, P Lacey, P Bondaronek, T Papakonstantinou, V Mallion, S Walker

09:50 **S36**

Prescribing patterns and treatment adherence in patients with asthma during the COVID-19 pandemic

H Dhruve, J Dhariwal, G d'Ancona, S Holmes, A Nanzer Kelly, DJ Jackson

08:45-10:05
SPOKEN SESSION: S37 – S41

Beyond acid-fast: diagnosis and treatment of TB in the 21st Century

Chaired by: Dr Odiri Eneje (Cambridge) and Professor Marc Lipman (London)

08:50 **S37**

Dual step interferon-gamma release assay testing can improve tuberculosis (TB) risk stratification in contacts of pulmonary TB: a prospective adult household contact cohort study

JW Kim, J Nazareth, J Lee, G Woltmann, A O'Garra, R Verma, P Haldar

09:05 **S38**

Evaluation of mycobacterium tuberculosis-specific IFN-g, TNF-a, CXCL10, IL2, CCL2, CCL7 and CCL4 levels for active tuberculosis diagnosis

A Fries, V Mandagere, R Parker, M Tolosa-Wright, L Berrocal-Almanza, L Hoang, A Boakye, A Halliday, A Lalvani

09:20 **S39**

Is the treatment of latent tuberculosis infection amongst recent migrants safe and effective in primary care?

M Burman, D Zenner, A Copas, L Goscé, H Haghparast-Bidgoli, P White, V Hickson, O Greyson, D Trathen, R Ashcroft, A Martineau, I Abubakar, C Griffiths, H Kunst

09:35 **S40**

Reducing numbers, increasing complexity: an evaluation of enhanced case management in the North Central London Tuberculosis Service 2013 to 2020

T Crocker-Buque, A Sanaie, H Booth, D Creer, I Cropley, S Lozewicz, J Potter, J White, M Lipman

09:50 **S41**

The diagnostic work up of pleural tuberculosis and the utility of GeneXpert: 5 year experience from a tertiary centre

H Aung, K Balasundaram, J Goss, H Patel, P Haldar, RK Panchal

08:45-10:20
SPOKEN SESSION: S42 – S47

What goes down, must come up: oscillation, obstruction and lung physiology

Chaired by: Professor Brendan Cooper (Birmingham) and Ms Suhani Patel (London)

08:50 **S42**

Correlation of measurement of small airways indices in a population of firefighters

J Feary, T Kabir, S Schofield, P Cullinan

09:05 **S43**

Repeatability of impulse oscillometry in patients with severe asthma

R Chan, BJ Lipworth

09:20 **S44**

Bronchodilator response for airway oscillometry in severe eosinophilic asthma

R Chan, CRW Kuo, BJ Lipworth

09:35 **S45**

A puff of sugar and a pinch of (Speech And Language Therapy) SALT: is the Mannitol challenge test a useful ingredient in the assessment of inducible laryngeal obstruction?

C Slinger, A Vyas, H Lever, R Slinger, J Silva, C Prior

09:50 **S46**

Lung function and pulmonary symptoms in classical and late-onset Fabry disease

AJ Shah, N Shafi, A Saigal, S Mandal, M Lipman, DA Hughes

10:05 **S47**

Hard to swallow; incidence of oropharyngeal dysphagia in Inducible Laryngeal Obstruction (ILO)

H Lever, K Prior, A Vyas, C Slinger

08:45-10:20
SPOKEN SESSION: S48 – S53

Developing treatments for COVID-19

Chaired by: Dr Tim Felton (Manchester) and Professor Alison Rodger (London)

08:50 **S48**

Lenzilumab efficacy and safety in newly hospitalized COVID-19 subjects: results from the LIVE-AIR phase 3 randomized double-blind placebo-controlled trial

Z Temesgen, CD Burger, J Baker, C Polk, CR Libertin, CF Kelley, VC Marconi, R Orenstein, VM Catterson, WS Aronstein, C Durrant, D Chappell, O Ahmed, G Chappell, AD Badley

09:05 **S49**

C-Reactive protein as a biomarker for improved efficacy of Lenzilumab in COVID-19 patients: results from the LIVE-AIR trial

Z Temesgen, CD Burger, J Baker, C Polk, CR Libertin, CF Kelley, VC Marconi, R Orenstein, VM Catterson, WS Aronstein, C Durrant, D Chappell, O Ahmed, G Chappell, AD Badley

09:20 **S50**

A randomised clinical trial of azithromycin versus standard care in ambulatory COVID-19 – the ATOMIC2 trial

TSC Hinks, L Cureton, R Knight, A Wang, JL Cane, VS Barber, J Black, SJ Dutton, J Melhorn, M Jabeen, P Moss, R Garlapati, T Baron, G Johnson, F Cantle, D Clarke, S Elkhodair, J Underwood, D Lasserson, ID Pavord, SB Morgan, D Richards

09:35 **S51**

Evaluation of treatment approaches for hospitalized COVID-19 patients

A Kilcoyne, E Jordan, C Durrant, D Chappell, O Ahmed

09:50 **S52**

Conventional oxygen therapy versus CPAP as a ceiling of care in ward-based patients with COVID-19: a multi-centre cohort evaluation

P Bradley, J Wilson, R Taylor, NWCORR Study group, P Whittemore, E Nuttall, A Ashish, A Bentley, T Bongers, T Gatheral, TW Felton, N Chaudhuri, L Pearmain

10:05 **S53**

Impact of empirical antibiotic use in patients with COVID-19 on morbidity and mortality during the first and second UK SARS-CoV-2 waves

S Waring, G Gamtkitsulashvili, S Kumar, Y Narayan, A D'Souza, S Jiwani, O Taylor, G Collins, K Patrick, A Sethuraman, S Naik, S Kuckreja, R Ragatha, M Anwar, U Ekeowa, P Russell

10:30-10:40

BTS NEWS BROADCAST

LIVE DAILY PREVIEW

A live round-up of highlights in today's programme, as well as a look at trending Tweets! #BTSWinter2021

11:00-11:50

POSTER DISCUSSION: P56 – P61

Cough: is it a problem and what can we do about it?

Chaired by: Mrs Jemma Haines (Manchester) and Dr Peter Saunders (Oxford)

P56 Chronic cough in Germany: prevalence and patient characteristics

JC Virchow, E Fonseca, H Salmen, VW Li, A Martin, JE Brady, J Schelfhout

P57 Patient global impression of severity scale characterises symptom severity in chronic cough

K Rhatigan, K Tsami, H Kesavan, RD Turner, CJ Jolley, JH Hull, SS Birring, PSP Cho

P58 The prevalence of chronic cough amongst females with stress urinary incontinence

P Cho, A Rantell, L Cardozo, J Schelfhout, H Langerman, H Ding, L Hennessy, C Atkinson, L Bateman, M Silvey, SS Birring

P59 Baseline characteristics and medical history of patients with refractory or unexplained chronic cough participating in two global phase 3 clinical trials

L McGarvey, SS Birring, P Dicpinigaitis, A Morice, I Pavord, JA Smith, B Iskold, Q Li, A Martin Nguyen, J Schelfhout, A Tzontcheva, C La Rosa, D Muccino

P60 Patient-reported improvements with gefapixant, a P2X3-receptor antagonist, over 52 weeks in two phase 3 clinical trials for refractory or unexplained chronic cough

SS Birring, P Dicpinigaitis, A Morice, JA Smith, L McGarvey, I Pavord, A Martin Nguyen, J Schelfhout, A Tzontcheva, Q Li, C La Rosa, D Muccino

P61 Pooled analysis of objective cough frequency in participants with chronic cough treated with gefapixant in two phase 3 clinical trials (COUGH-1 and COUGH-2)

JA Smith, A Morice, L McGarvey, I Pavord, SS Birring, P Dicpinigaitis, B Iskold, Q Li, A Tzontcheva, C La Rosa, D Muccino

11:00-12:05

SPOKEN SESSION: S54 – S57

Understanding COVID-19 mechanisms

Chaired by: Dr Puja Mehta (London) and Dr Karl Staples (Southampton)

11:05 **S54**

Elevated NETosis and migration but impaired anti-microbial responses in neutrophils from non-ICU, hospitalized COVID-19 patients

K Belchamber, S Thein, J Hazeldine, F Grudzinska, A Jasper, M Hughes, KP Yip, E Sapey, D Parekh, D Thickett, A Scott

11:20 **S55**

Persistent changes to the nasal ciliated epithelium following SARS-CoV2 infection: a longitudinal cohort analysis from FOLLOW-COVID

A Shoemark, M Bottier, A Pinto, L Delgado, H Abo-Leyah, R Rai, B Parcell, C Hocking, C Hogg, A Dicker, F Khan, S Gallant, DM Cassidy, D Connell, JD Chalmers

11:35 **S56**

Measures of inflammation, complement activation and coagulation in patients with COVID-19

L Wiffen, T Brown, M Chauhan, L Fox, S Glaysher, S Elliott, L D'Cruz, M Nunn, T Higenbottam, AJ Chauhan

11:50 **S57**

Expression of the SARS-CoV-2 receptors ACE2 and TMPRSS2 in the respiratory tract of children and adults

AG Nuttall, C Hedrich, C Semple, P Losty, R Shukla, J McPartland, S Williams, S Northey, P McNamara

11:00-12:20

SPOKEN SESSION: S58 – S62

Treatment choices in cystic fibrosis and bronchiectasis: what works and when

Chaired by: Dr Donna McShane (Cambridge) and Dr Philip Mitchelmore (Exeter)

11:05 **S58**

Triple CFTR modulators improve sino-nasal and laryngopharyngeal reflux symptoms in people with advanced cystic fibrosis lung disease

S Shakir, C Echevarria, S Doe, M Brodlie, C Ward, SJ Bourke

11:20 **S59**

Adherence to nebulised therapies in people with cystic fibrosis starting Elexacaftor/Tezacaftor/Ivacaftor (Kaftrio)

IB Howell, A Tugwell, D Bhaskaran, NJ Bell

11:35 **S60**

Observational study of ivacaftor in people with cystic fibrosis and selected non-G551D gating mutations: final results from VOCAL

NJ Simmonds, K van der Ent, C Colombo, N Kinnman, C DeSouza, T Thorat, K Chandarana, C Castellani

11:50 **S61**

Respiratory microbiology outcomes from an observational study of ivacaftor in people with cystic fibrosis and non-G551D gating mutations (VOCAL)

C Castellani, NJ Simmonds, C Colombo, N Kinnman, C DeSouza, T Thorat, M Chew, K Chandarana, K van der Ent

12:05 **S62**

The microbiology of bronchiectasis exacerbations in the UK EMBARC registry and implications for prescribing in primary care: a cohort study

F Mosgrove, C Haworth, M Loebinger, M Crichton, P Goeminne, A Shoemark, E Polverino, S Aliberti, A DeSoyza, JD Chalmers

11:00-12:20

SPOKEN SESSION: S63 – S67

What's in a genotype? Unpicking genetic links in complex disease

Chaired by: Professor Miriam Moffatt (London) and Dr Mark Toshner (Cambridge)

11:05 **S63**

Genome-wide sex-by-SNP interaction analysis of susceptibility to idiopathic pulmonary fibrosis

OC Leavy, RJ Allen, JM Oldham, B Guillen-Guio, A Stockwell, R Braybrooke, RB Hubbard, S Ma, TE Fingerlin, N Kaminski, Y Zhang, DA Schwartz, B Yaspan, TM Maher, PL Molyneaux, C Flores, I Noth, RG Jenkins, LV Wain

11:20 **S64**

Application of open virtual PheWAS tools for exploratory analyses of risk alleles in idiopathic pulmonary fibrosis

S Moss, I Stewart, RG Jenkins

11:35 **S65**

Genome-wide association study of survival times after diagnosis of idiopathic pulmonary fibrosis

RJ Allen, JM Oldham, JM Lorenzo-Salazar, PL Molyneaux, SF Ma, A Stockwell, C Joseph, JS Kim, B Guillen-Guio, T Hernandez-Beeftink, J Kropski, Y Huang, CT Lee, A Adegunsoye, JV Pugashetti, A Linderholm, V Vo, M Strek, R Hubbard, N Hirani, MKB Whyte, S Hart, A Nicholson, H Parfrey, D Rassl, W Wallace, WA Fahy, E Valenzi, Y Zhang, N Kaminski, P Wolters, M Molina-Molina, FJ Martinez, I Hall, MD Tobin, TM Maher, T Blackwell, B Yaspan, RG Jenkins, C Flores, LV Wain, I Noth

11:50 **S66***

Iron deficiency: complications, compensations and treatments by hereditary haemorrhagic telangiectasia molecular genotype

L Sharma, A Rizvi, N Badiani, A Soni, CL Shovlin

12:05 **S67**

Whole genome sequencing of patients with pulmonary arteriovenous malformations and hereditary haemorrhagic telangiectasia

KE Joyce. West London Genomic Medicine Centre Consortium, Genomics England Research Consortium, F Boardman-Pretty, CL Shovlin

***S66 – BTS Medical Student Awards – Highly Commended**

11:00-12:25
POSTER DISCUSSION: P62 – P72

Breaking barriers in pulmonary rehabilitation and physiotherapy

Chaired by: Dr Enya Daynes (Leicester) and Dr Matthew Pavitt (Brighton)

P62 Use of a computer guided consultation (clinical decision support system) enables detailed characterisation of patients presenting to a teaching centre sleep service and shows that insomnia is frequently reported in this patient group

M Ahmad, M Thomas, M Brady, B Chakrabarti, R Angus, M Pearson, L Reed, E McKnight, J Wood, P England, S Craig

P63 Assessing which patient relevant features of an Oscillating Positive Expiratory Pressure (OPEP) device are most important in the real world – results from an independent clinical assessment in UK

A Bracey, J Suggett

P64 Prevalence of breathing pattern disorders with chronic refractory cough and the outcomes of physiotherapy management

R De Vos, H Rupani, T Brown, L Fox, L Wiffen, AJ Chauhan

P65 Remote delivery options for self-management programmes for patients with COPD during the COVID-19 pandemic. Uptake, completion and clinical outcomes

L Houchen-Wolloff, S Ward, EJ Chaplin, NY Gardiner, SJ Singh

P66 Does an inner-city London virtual pulmonary rehabilitation programme produce clinically significant improvements in patient outcomes?

LM Graham, K Barr, AB Kenward

P67 Pilot project: feasibility of minimal-equipment High-Intensity Interval Exercise (HIIE) interventions in bronchiectasis patients

KF Parrott, D Taylor, A Jenkins, A Jones

P68 A retrospective service evaluation of a virtual respiratory physiotherapy outpatient clinical service

S Parkin, A Long, I Forys, R Allen

P69 Does patients' experience improve on the PREM-9 after a 6-week pulmonary rehabilitation programme?

SM Chavaillaz, EJ Chaplin, E Dayes, S Ward, SJ Singh, D Coope, L Houchen-Wolloff

P70 The impact of post COVID-19 rehabilitation on hospital and non-hospitalised participant – is there a difference?

SJ Singh, AC Watt, L Houchen-Wolloff, S Ward, EJ Chaplin, NY Gardiner, E Daynes

P71 Patients with long COVID benefit from rehabilitation independently of the severity of the acute course of the disease

PS Schueller, JF Frommhold

P72 Using the multidimensional dyspnoea profile in COVID-19 – the different sensations of breathlessness and their impact

E Daynes, C Gerlis, L Houchen-Wolloff, N Gardiner, SJ Singh

11:00-12:30
SYMPOSIUM

COVID-19: WE PLANNED, WE DELIVERED, WHAT HAS CHANGED?

Chaired by: Dr Kenneth Baillie (Edinburgh) and Dr Charlotte Summers (Cambridge)

11:00 Pandemic planning in critical care

Professor Ramani Moonesinghe (London)

11:30 Non-invasive respiratory support in COVID-19: what have we learnt so far?

Professor Gavin Perkins (Warwick)

THURSDAY 25 NOVEMBER 2021

12:00 Critical care rehabilitation during COVID-19: improving long term outcomes from critical care

Dr Bronwen Connolly (Belfast)

Learning objectives

1) An understanding of national pandemic planning for COVID-19, including insights into NHS structure and management and a national quality improvement project.

2) To understand the importance of non-invasive respiratory support in prevention of intubation in COVID-19 and the management of clinical trials during pandemic COVID-19.

3) To understand the role of rehabilitation and follow up in critical illness in terms of improving acute outcomes from COVID-19 and in the longer term.

11:00-13:00
SYMPOSIUM
TB: GLOBAL LESSONS FOR ALL!

Chaired by: Professor Marc Lipman (London) and Professor Kevin Mortimer (Liverpool)

11:00 Patient perspective – living with TB

Ingrid Schoeman (Pretoria)

11:30 Hot topics in TB in the Global South – what we think the Global North needs to know

Dr Stellah Mpagama (Tanzania)

12:00 Hot topics in TB in the Global North – what we think the Global South needs to know

Dr Esther Robinson (PHE)

12:30 The competing global pandemics of COVID-19 and TB – what have we learned and where do we go from here?

Professor Nim Arinaminpathy (London)

Learning objectives

1) Hear perspectives from people and communities affected by TB in the UK and Global South.

2) Share learning from TB experience and research in the Global South and North.

3) Share learning about the impacts of COVID-19 on TB and vice versa and implications for the Stop TB agenda.

12:30-13:00
SYMPOSIUM
INSPIRE – A NATIONAL RESPIRATORY TRAINEES RESEARCH NETWORK

SCIENTIFIC PROGRAMME

Chaired by: Professor Najib Rahman (Oxford) and Professor Dinesh Saralaya (Bradford)

12:30 The INSPIRE network – purpose and plans

Professor Anthony de Soyza (Newcastle upon Tyne)

12:40 How to get involved in INSPIRE

Dr Akhilesh Jha (Cambridge) and Dr Victoria Randles (Crewe)

12:50 Questions and panel discussion

Dr Akhilesh Jha (Cambridge), Dr Thomas Jones (Salisbury), Dr Swapna Mandal (London), Dr Victoria Randles (Crewe) and Professor Elizabeth Sapey (Birmingham)

Session overview

We would like to introduce you to a new research initiative called the Integrated Respiratory Research Collaborative (INSPIRE). We aim to develop a network of high-quality large-scale respiratory research projects driven by enthusiastic early career researchers, initially respiratory registrars and subsequently allied health professionals, and supported by established clinical academics. Our mission is to create a vibrant, dynamic and inclusive community leading to better research evidence for our patients and better research career opportunities for our healthcare professionals.

12:45-13:00
BTS NEWS BROADCAST
INTERVIEW TIME

Professor Elizabeth Sapey, Chair of the BTS Science and Research Committee, in conversation with the in-coming BTS President, Rachael Moses.

13:00-13:45
GUEST LECTURE
THE BTS CLINICAL LECTURE EARLY COPD COHORT DATA

Professor Wisia Wedzicha (London)

Introduced by: Professor Jon Bennett (Leicester)

Learning objectives

To learn what is "early COPD", how we can more accurately predict who is at risk of developing COPD, and what potential treatment modalities might mitigate disease progression.

14:00-14:50
POSTER DISCUSSION: P73 – P78

Virtually perfect: remote medicine and digital health

Chaired by: Mr Bhavin Mehta (London) and Professor Hilary Pinnock (Edinburgh)

P73 Implementation of a computer guided consultation (intelligent clinical decision support system software) in the Liverpool Sleep Service: the creation of a digital ecosystem to transform patient pathways

B Chakrabarti, RM Angus, P England, M Ahmad, M Brady, MG Pearson, E McKnight, L Reed, M Thomas, SE Craig

P74 Digital transformation – the beating heart of a modern COPD service

S Gompertz, R Wagstaff, S Rees, R Colclough

P75 A comparison of telephone versus face-to-face consultations when commencing CPAP therapy for obstructive sleep apnoea

MV Foster, MTC Thomas, S Mitchell, T McKown, SE Craig

P76 Improving community-based care using online communication portal for patients with an indwelling pleural catheter

J Liang, K Ur Rehman, P Sivakumar

P77 Outcomes in pandemic asthma diagnostics with home spirometry

Y Ge, J Ming, J Feary, JH Hull, PH Patel

P78 Improving the accessibility of peak expiratory flow during the COVID-19 pandemic using a patient-friendly system

L Fox, R De Vos, K Harbour, L Wiffen, R Harvey, B Reeve, S Folini, M Tolson, C Mason, AJ Chauhan, T Brown

14:00-15:00
POSTER DISCUSSION: P79 – P85

The real-world care of COPD patients

Chaired by: Professor Charlotte Bolton (Nottingham) and Dr Justine Hadcroft (Liverpool)

P79 The CURE project: experience of care and perceptions in patients that smoke admitted to hospital

L Hryhorskyj, F Howie, C Groom, R Moore, C Pearse, M Baugh, E Ashton, E Manley, C Dixon, C Gallagher, H Huddart, K Melia, M Rutherford, A Coleman-Mawson, K Hewitt, M Evison

P80 Ambivalence or blind faith? Attitudes and experiences in a community CURE respiratory smoking cessation services

D Kadar, S Sharma, S Sibley, D Wat, S Jalota, C Gupta

P81 An AHP-led, quality improvement project to reduce the hospitalisation rate of patients with acute exacerbation of COPD

J Tramond, S McGuire, E Krievs, E Taylor, A Ruddock, H Bayes

P82 The real-world use of Azithromycin in patients with chronic obstructive pulmonary disease

N Khatoon, T Gordon, H Ajay, A Ponnuswamy

P83 Chronic obstructive pulmonary disease – obstructive sleep apnoea overlap syndrome management – a National survey

TB Fretwell, K George, SD West

P84 Identifying chronic obstructive pulmonary disease – obstructive sleep apnoea overlap syndrome – does it matter?

TB Fretwell, RE Sobala, D McCourt, IB Bittiner, A Armstrong, B Messer, SD West

P85 Respiratory depression in opioid dependent chronic obstructive pulmonary disease patients

B Tas, NJ Kalk, PSP Cho, M Lozano-Garcia, GF Rafferty, M Kelleher, J Moxham, J Strang, CJ Jolley

14:00-15:30
SYMPOSIUM

HIGHLIGHTS FROM JAMA AND THORAX

Chaired by: Professor George O'Connor (Associate Editor, JAMA) and Professors Nicholas Hart, Gisli Jenkins and Alan Smyth (Joint Editors-in-Chief, Thorax)

Four cutting edge papers from the 2021 issues of the Journal of the American Medical Association and Thorax will be presented. In order to include the most recently published papers, details will be confirmed nearer to the time and will be available via the online programme.

THURSDAY 25 NOVEMBER 2021

14:00-15:30
SYMPOSIUM

NON-TUBERCULOUS MYCOBACTERIA: TRANSLATING SCIENCE INTO CUTTING EDGE CARE

Chaired by: Dr David Connell (Dundee) and Dr Clare Sander (Cambridge)

14:00 Which factors – host, microbial and environmental – determine the outcomes of NTM infections?
Dr Jennifer Honda (Denver)

14:30 Results of the National NTM UK Survey of Practice and review of international data
Dr Heinke Kunst (London)

15:00 Treating the untreatable: guideline-based approaches and emerging therapies for NTM
Dr Charles Haworth (Cambridge)

Learning objectives

1) To learn how cutting-edge laboratory techniques are informing our understanding of NTM disease and epidemiology.

2) To learn what new therapies will be used in the next decade to treat complex NTM infections.

3) To describe the current clinical care landscape for patients with NTM in the UK.

14:00-15:30
SYMPOSIUM

BTS AUDIT AND QUALITY IMPROVEMENT

Chaired by: Professor Michael Steiner (Leicester)

14:00 Introduction to the BTS QI and Audit Programme
Professor Michael Steiner (Leicester)

14:10 Pleural Services Organisational Audit
Dr Matthew Evison (Manchester) and Dr Andrew Stanton (Newcastle upon Tyne)

14:35 2021 Smoking Cessation Audit
Dr Nikesh Devani (London) and Dr Matthew Evison (Manchester)

15:00 Update on the BTS 3-year Tobacco Dependency Project
Dr Zaheer Mangera (London) and Ms Melanie Perry (BTS)

14:00-15:30
POSTER DISCUSSION: P86 – P97

COVID-19: clinical features and risk

Chaired by: Dr Toby Hillman (London) and Dr David Jenkins (Leicester)

P86 Characterising anosmia in hospitalised patients with COVID-19
K Florman, M Jayne, A Berezowska, E Abouelela, J Hudson, T Al-Mayhani

P87 Clinical characteristics of COVID-19 patients with pulmonary embolism in 1st and 2nd waves
AJ Chung, MN Dang, T Niaz, P Palchaudhuri

P88 Initial routine laboratory tests can be used to predict clinical course in patients hospitalised with COVID-19
RL Young, KV Mullins, A Ainley

P89 Vitamin D deficiency increases susceptibility to COVID-19 infection
S Kumar, R Ragatha, S Waring, G Gamtkitsulashvili, A D'Souza, M Mahenthiran, S Tan, M Parsons, S Visuvanathan, A Sefton, U Ekeowa, P Russell

P90 Use of Procalcitonin to predict morbidity and mortality in COVID-19
S Kumar, A D'Souza, G Gamtkitsulashvili, S Waring, Y Narayan, G Collins, O Taylor, S Jiwani, K Patrick, A Sethuraman, S Naik, S Kuckreja, R Ragatha, M Anwar, U Ekeowa, P Russell

P91 Impact of bacterial infections in patients with COVID-19 on morbidity and mortality during the second UK SARS-CoV-2 wave
S Waring, G Gamtkitsulashvili, S Kumar, Y Narayan, A D'Souza, S Jiwani, O Taylor, G Collins, K Patrick, A Sethuraman, S Naik, S Kuckreja, R Ragatha, M Anwar, U Ekeowa, P Russell

P92 What is the burden of Aspergillosis and other opportunistic fungal infections in patients with severe influenza and COVID-19 in the ICU?

J Menendez Lorenzo, DJ Dhasmana

P93 Comparison of inflammatory profiles between COVID-19 and other acute lower respiratory tract infections: results from the PREDICT-COVID-19 study

HR Keir, MB Long, YH Giam, HA Leyah, T Pembridge, L Delgado, R Hull, C Hughes, A Gilmour, C Hocking, BJM New, D Connell, H Richardson, D Cassidy, A Shoemark, JD Chalmers

P94 Influenza and COVID-19 pneumonia: the difference is pulmonary hypertension

S Desai, A Devaraj, S Dintakurti, C Mahon, S Padley, S Singh, B Rawal, C Ridge, T Semple

P95 Elevated D-dimers in COVID-19 patients predict PE but caution is needed with higher thresholds

J Walker, R Hughes, A Ainley

P96 Pulmonary vascular disease in COVID-19: insights from artificial intelligence analysis in a large multicentre imaging database

J Rossdale, P Charters, R Foley, W Brown, T Burnett, R Mackenzie Ross, J Suntharalingam, J Rodrigues

P97 Disease severity and patient recovery in COVID-19: an observational study comparing first and second wave admissions in London

A Saigal, CN Niklewicz, SB Naidu, HM Bintalib, AJ Shah, G Seligmann, A Hunter, D Miller, I Abubakar, E Wey, C Smith, NG Jain, J Barnett, S Brill, J Goldring, H Jarvis, JR Hurst, M Lipman, S Mandal

14:00-15:45

POSTER DISCUSSION: P99 – P112

The wider impact of the pandemic

Chaired by: Dr Martin Allen (Stoke-on-Trent) and Dr Aashish Vyas (Preston)

P99 COPD patients' knowledge, training and adherence with inhalation therapies during COVID-19

A Rohatgi, S Meah, OS Usmani

P100 Impact of the COVID-19 pandemic on health services utilisation in a lung cancer screening cohort

AW Creamer, J Dickson, C Horst, S Tisi, H Hall, P Verghese, R Prendecki, J McCabe, K Phua, S Mehta, K Gyertson, AM Mullin, J Teague, L Farrelly, A Hackshaw, S Janes

P101 Mortality in patients requiring home mechanical ventilation during the COVID-19 pandemic: experiences of a regional specialist ventilation unit

RF D'Cruz, NM Shah, A Learoyd, OJ Elias, M Mackie, N Weston, G Kaltsakas, ES Suh, P Marino, M Ramsay, S Srivastava, H Pattani, J Steier, N Hart, PB Murphy

P102 Psychosocial themes of the impact of the COVID-19 pandemic and shielding in adults and children with early-onset neuromuscular disorders and their families

L Spurr, H-L Tan, R Wakeman, M Chatwin, A Simonds

P103 Provision of pleural disease care in the pandemic era: a single centre experience

K Ur Rehman, J Liang, P Sivakumar

P104 COVID-19 mortality in cancer patients on systemic anti-cancer treatments during the second UK SARS-CoV-2 wave

S Waring, G Gamtiksulashvili, S Kumar, A D'Souza, S Jiwani, O Taylor, G Collins, Y Narayan, K Patrick, A Sethuraman, S Naik, S Kuckreja, R Ragatha, M Anwar, U Ekeowa, P Russell

P105 Breaking barriers to Singing for Lung Health during the COVID-19 pandemic

K Crowley, I Du Rand

P106 The impact of technician-led virtual spirometry sessions on the availability and quality of home spirometry results in a virtual cystic fibrosis clinic

C Long, T Modzelewski, NJ Bell

P107 Creating a new role on resuscitation teams responsible for PPE and team safety significantly improves the safety of resuscitation teams working in the pandemic: a single centre study

P Dobson, T Sidney

P108 Annual physiotherapy reviews in a specialist respiratory clinic for bronchiectasis: the impact of COVID-19 on an already strained workforce

F Livingstone, R Wagstaff, F Rauf, A Sullivan, L Gardiner, R Colclough

P109 Infection control policies during the COVID-19 pandemic were effective in limiting morbidity and mortality associated with nosocomial viral transmission at a large NHS respiratory department

H Aung, K Kyaw, RC Free, J Blount, D Jenkins, J Tang, SP Range, P Haldar, G Woltmann

P110 Assessing COVID vaccine related side-effects profile and subsequent staff sickness burden in healthcare workers

R Muthusami, S Adeyeye, B Mwale, S Rhammaz, M Du Rand, A Johnson, I Du Rand

P111 The impact of COVID-19 on a tertiary interventional bronchoscopy service

A Bhamani, R Khan, R Shea, R Thakrar, S Janes, N Navani

P112 The impact of COVID-19 pandemic on lung cancer diagnosis and treatment at St George's Hospital

D Jajbhay, J Arberry, J Gates, J Panguiton, E Yarham, YE Ong, A Draper

16:00-17:30
SYMPOSIUM

RECENT ADVANCES IN CF: WHAT'S RELEVANT TO OTHER DISEASES?

Chaired by: Dr Maya Desai (Birmingham) and Dr Helen Rodgers (Glasgow)

16:00 Theranostics: personalised medicine guided by ex-vivo testing

Dr Francois Vermeulen (Leuven)

16:30 Secondary CFTR dysfunction in chronic airways disease: a role for modulator drugs?

Dr Steven Rowe (Alabama)

17:00 Telemedicine, digital monitoring and machine learning

Professor Andres Floto (Cambridge)

SCIENTIFIC PROGRAMME

Learning objectives

1) To appreciate the role of ex vivo organoid systems to predict drug responses in lung disease.

2) To understand the potential for CFTR modulation in other lung diseases.

3) To recognise how machine learning can predict clinical deteriorations and long-term clinical trajectories in CF and by extension other chronic lung diseases.

16:00-17:45
SYMPOSIUM

PLENARY SCIENTIFIC

Chaired by: Professor Elizabeth Sapey (Birmingham) and Dr Chris Scotton (Exeter)

16:00 Disruptive optical technologies to advance respiratory medicine and critical care

Professor Kev Dhaliwal (Edinburgh)

16:25 COVID-19 pathogenesis: common themes and unique features

Dr Ryan Thwaites (London)

16:50 Innate immune signatures in COVID-19 during acute disease and convalescence

Dr Elizabeth Mann (Manchester)

17:15 3D bioprinting airway and lung tissue for transplantation: hype or future therapy?

Dr Darcy Wagner (Lund)

Learning objectives

1) To learn how molecular imaging has the potential to revolutionise the practice of medicine.

2) To learn about the features of the immune response to COVID-19 that contribute to pathogenesis.

3) To understand the balance needed for our innate immune system to clear infection, and then reduce by-stander damage in the context of COVID-19.

4) To learn about different approaches for 3D bioprinting tissue in the lab for disease modelling as well as for potential tissue transplantation.

18:00-18:30
BTS NEWS BROADCAST

TWILIGHT HIGHLIGHTS

A live, entertaining discussion and review of the day's sessions, and highlights not to miss on demand after the Meeting ends.

FRIDAY 26 NOVEMBER 2021

07:30-18:00
POSTER VIEWING

All posters are available on demand throughout the three days in the Poster Hall, and should be viewed prior to joining the live poster sessions at the programmed times.

P113-P119
Thinking outside the lung: monitoring and management of patients with CF, PCD and bronchiectasis
Live discussion of these poster abstracts will take place from 10:30-11:30

P120-P129
Improving care pathways in adults and children
Live discussion of these poster abstracts will take place from 10:30-11:45

P130-P143
COVID-19 recovery: predicting long term outcomes
Live discussion of these poster abstracts will take place from 10:30-12:15

P144-P152
Assessing, managing and predicting outcomes in ILD
Live discussion of these poster abstracts will take place from 13:30-14:40

P153-P161
New treatment pathways in the post-COVID-19 era
Live discussion of these poster abstracts will take place from 13:30-14:40

P162-P172
Topics in thoracic malignancies
Live discussion of these poster abstracts will take place from 13:30-14:55

P173-P183
Perspectives on education, training and research collaboration
Live discussion of these poster abstracts will take place from 13:30-14:55

P184-P190
Fighting back: optimising treatment for COVID-19
Live discussion of these poster abstracts will take place from 15:30-16:30

P191-P199
Perspectives on pleural disease
Live discussion of these poster abstracts will take place from 15:30-16:40

P200-P209
Asthma: phenotyping and the response to biologics
Live discussion of these poster abstracts will take place from 15:30-16:45

P210-P220
Oxygen, CPAP, NIV or ICU: what works in COVID-19?
Live discussion of these poster abstracts will take place from 15:30-16:55

8.00am – 8.30am
BTS JOURNAL CLUB
SLEEP

Dr Alanna Hare (London)

Learning objectives

Something to wake up for! An update about the latest evidence in sleep medicine, including recently published studies.

08:30-09:50
SPOKEN SESSION: S68 – S72
Gazing through the crystal ball: predicting outcomes from COVID-19

Chaired by: Dr Hasan Burhan (Liverpool) and Dr Melissa Heightman (London)

08:35 **S68**

National COVID point of care lung ultrasound evaluation (Society for Acute Medicine with the Intensive Care Society)

T Knight, P Parulekar, G Rudge, F Lesser, M Dachsel, A Aujayeb, D Lasserson, N Smallwood

08:50 **S69**

Inflammatory biomarkers predict clinical outcomes in patients with COVID-19 infection: results from the PREDICT-COVID19 study

MB Long, HR Keir, YH Giam, H Abo Leyah, T Pembridge, L Delgado, R Hull, A Gilmour, C Hughes, C Hocking, BJM New, D Connell, H Richardson, DM Cassidy, A Shoemark, JD Chalmers

09:05 **S70**

Effectiveness of different parameters at admission as prognostic markers for mortality due to SARS-CoV-2: a 2-centre experience in UK and Spain

ME Shuvo, M Schwiening, F Soares, R Thompson, O Feng, RJ Samworth, NW Morrell, SJ Marciniak, W Thomas, E Soon

09:20 **S71**

A retrospective analysis of ROX score for predicting treatment failure and progression to invasive ventilation in COVID patients requiring enhanced respiratory support

DJ Ritchie, S Fairbairn

09:35 **S72**

Lung function outcomes in children with Paediatric Inflammatory Multisystem Syndrome – Temporally Associated with SARS-CoV-2 (PIMS-TS)

M Riley, C Doughty, R Brugha

08:30-09:50
SPOKEN SESSION: S73 – S77

A cut above: an update in thoracic surgery

Chaired by: Mr Aman Coonar (Cambridge) and Mr Douglas West (Bristol)

08:35 **S73**

Management of bronchial stenosis in post lung transplantation – initial evaluation of biodegradable stents

S Cyclewala, M Nardini, A Padukone, N Asadi

08:50 **S74**

Lung volume reduction: a large-volume single-centre experience with an analysis of seasonal variation

ADG Rogers, AJB Kirk, R Bilancia

09:05 **S75**

Redo bronchoscopy after endobronchial lung volume reduction – indications and implications

M Lee, R Baranowski, D Waller

09:20 **S76**

Chest trauma: an experience of a respiratory support unit with level 2 care in the North East of England

K Jackson, T Basterfield, J Bates-Powell, A Aujayeb

09:35 **S77**

The effect of surgery on lung function in patients with idiopathic scoliosis

SA Trotter, IE Williams, EK Finnerty, M Rutter, S Charlton, RIR Russell

08:30-09:50
SPOKEN SESSION: S78 – S82

Under pressure: an update in pulmonary vascular disease

Chaired by: Dr Katherine Bunclark (Cambridge) and Dr Laura Price (London)

08:35 **S78**

Predicting postcapillary pulmonary hypertension: validation of the H2FPEF and OPTICS scores

H Stubbs, MK Johnson

08:50 **S79**

Selexipag titration and dosing patterns in patients with pulmonary arterial hypertension (PAH) in a real-world clinical setting: insights from the EXPOSURE study

MK Johnson, TJ Lange, S Söderberg, P Biedermann, A Muller, K Luik, P Escribano, S Gaine

09:05 **S80**

The diagnosis and management of catheter-associated upper-extremity deep venous thrombosis (CA-UEDVT): a systematic review

OA Aniftos, AKG Kafai Golahmadi, AC Chapman

09:20 **S81**

10 year retrospective audit from ambulatory pulmonary embolism pathway in a tertiary hospital

R Sudhir, E Bailie, N Parmar

09:35 **S82**

Using cardiac magnetic resonance imaging to assess cardiac geometry in the diagnosis of chronic thromboembolic disease and chronic thromboembolic pulmonary hypertension

M McGettrick, H Dormand, M Brewis, NN Lang, M Johnson, AC Church

08:30-10:00
SYMPOSIUM

STATE OF THE ART PLEURAL DISEASE MANAGEMENT: LATEST EVIDENCE FROM UK TRIALS

Chaired by: Dr Eihab Bedawi (Oxford) and Laura McNaughton (Glasgow)

08:30 What is the optimal first line intervention for malignant pleural effusions? Results of the OPTIMUM study

Dr Deepan Sivakumar (London))

09:00 What is the optimal first line management for benign organ failure pleural effusions? Results of the REDUCE study

Dr Steven Walker (Bristol)

09:30 Optimising pleurodesis protocols – results of the SIMPLE study

Dr John Corcoran (Plymouth)

Learning objectives

1) To understand the results and impact of an RCT comparing the impact on quality of life from indwelling pleural catheters versus Seldinger chest drain and talc slurry in patients with malignant pleural effusions.

2) To understand the results and impact of an RCT comparing indwelling pleural catheters versus standard care in benign pleural effusions.

3) To understand the results and impact of an RCT comparing ultrasound guided pleurodesis assessment protocol versus standard care following a talc pleurodesis.

08:30-10:00
SYMPOSIUM

THE CHALLENGE OF MEDICINE NON-ADHERENCE IN RESPIRATORY DISEASE

Chaired by: Professor Anna Murphy (Leicester) and Dr Aashish Vyas (Preston)

08:30 Medicine adherence in severe asthma

Grainne D'Ancona (London)

09:00 Managing non-adherence in adult patients with cystic fibrosis

Dr Martin Wildman (Sheffield)

09:30 Will the use of SMART technologies revolutionise medicine adherence in asthma and COPD?

Professor Richard Costello (Dublin)

Learning objectives

1) To discuss the complexities of non-adherence in people with respiratory disease.

2) To highlight how to monitor and address non-adherence in people with respiratory disease.

3) To discuss the evidence and use of smart inhaler technology in supporting people with managing their medicines.

08:30-10:00
SYMPOSIUM

EXPLORING THE ILL-EXPLORED: IDENTIFYING OCCUPATIONAL RISK FACTORS FOR LUNG DISEASE

Chaired by: Dr Chris Barber (Sheffield) and Dr Jennifer Hoyle (Manchester)

08:30 Risk factors for COVID-19: occupation or preoccupation?

Professor Andrew Curran (HSE)

09:00 IPF, smoking and asbestos exposure: is it all in the genes?

Dr Carl Reynolds (London)

09:30 HP – screening for occupational and environmental causes: what is the pick up?

Dr Hayley Barnes, (Melbourne, Australia)

Learning objectives

1) To better understand how national research projects have helped our understanding of COVID-19 risk factors in the workplace.

2) To increase awareness of the role that genetic polymorphisms and historic environmental exposures play in IPF.

3) To review international consensus opinion on how we should screen HP patients for occupational and environmental causes.

FRIDAY 26 NOVEMBER 2021

08:30-10:05
SPOKEN SESSION: S83 – S88

Biologics for asthma

Chaired by: Dr Robert Niven (Manchester) and Dr Hitasha Rupani (Southampton)

08:35 **S83**

The impact of an online patient-facing tool on severe asthma referrals

C Renwick, C Cheung, A Fallas, J Kirby, S Walker

08:50 **S84**

Long-term efficacy of Dupilumab: 3-year data of QUEST patients with moderate-to-severe asthma enrolled in LIBERTY ASTHMA TRAVERSE

ID Pavord, A Papi, A Bourdin, H Watz, C Domingo, ME Wechsler, X Mao, B Ortiz, M Djandji, L Mannent, E Laws, N Amin, DJ Lederer, M Hardin

09:05 **S85**

Clinical characteristics associated with mucus plugging in severe eosinophilic asthma and the effectiveness of benralizumab treatment

AP Hearn, MS Mak, I Budaj, N Qurashi, O Snell, J Kavanagh, M Fernandes, L Green, C Roxas, L Thomson, G d'Ancona, J Dhariwal, AM Nanzer, DJ Jackson

09:20 **S86**

Long-term assessment of exacerbations and lung function in the LIBERTY ASTHMA TRAVERSE study, stratified by lung function improvements at the end of the phase 3 LIBERTY ASTHMA QUEST parent study

A Bourdin, NA Hanania, D Dorscheid, X Muñoz, Y Tohda, N Daizadeh, J Jacob-Nara, B Ortiz, M Djandji, Y Deniz, PJ Rowe

09:35 **S87**

Severe asthma outcomes when switching from mepolizumab to benralizumab in non-responders with persistent sputum eosinophilia

G Tavernier, M Philbin, LJ Holmes, L Elsey, D Allen, S Fowler

09:50 **S88**

Use of a connected inhaler system in the pre-biologic assessment of patients with severe asthma

J Holmes, P Dennison, DJ Jackson, G D'Ancona, A Mansur, A Menzies-Gow, P Patel, P Pfeffer, C Chen, D Shaw, Propeller Health, LG Heaney

10:05-10:15
BTS NEWS BROADCAST

LIVE DAILY PREVIEW

A live round-up of highlights in today's programme, as well as a look at trending Tweets! #BTSWinter2021

10:30-11:30
POSTER DISCUSSION: P113 – P119

Thinking outside the lung: monitoring and management of patients with CF, PCD and bronchiectasis

Chaired by: Dr Rebecca Thursfield (Liverpool) and Dr Emem-Fong Ukor (London)

P113 Segregation in cystic fibrosis: the perceptions of patients and caregivers

JM Martin

P114 Asymmetrical distribution of demand for cystic fibrosis inpatient services and implications for future care needs

O Crozier, A Jones, A Horsley

P115 The diagnosis and monitoring of cystic fibrosis liver disease in a West of Scotland CF cohort

P Holland, DJ Leith, M Priest, S Thomson, S Bicknell, G MacGregor

P116 A novel tool to interpret the Incremental Shuttle Walk Test (ISWT) in a Cystic Fibrosis (CF) paediatric population

J Simpson, F Robinson, A Burrill, B Heyeer, A Toffin, P Kenia, M Desai, P Nagakumar

P117 HbA1C monitoring in patients with Cystic Fibrosis Related Diabetes (CFRD) during COVID-19 pandemic

M Zafran, M Yousif, D Bhaskaran, J Robinson, J Read, A Keele, K Bateman

P118 The role of paediatric respiratory nurse specialist in management of non-CF bronchiectasis

H Smith, T Evans, P Nagakumar, M Desai, L Morris, S Stone, C Mcardle, N Parsons, K Hunjan, B Hayeer, P Kenia

P119 Breathing pattern dysfunction in primary ciliary dyskinesia: myth or reality?

GM Housley, S Peake, M Loebinger

10:30-11:45

POSTER DISCUSSION: P120 – P129

Improving care pathways in adults and children

Chaired by: Mrs Leanne Jo Holmes (Manchester) and Dr Janet Stowell (London)

P120 The effect of medical face mask on adolescent children's oxygen saturation during 6-minute walk test

A Ahmad, M Fatima, MZ Equabal

P121 Does Methacholine challenge test improve asthma diagnostic certainty in children age 5-16yr?

L Healy, A Hargreaves, R Wang, S Drake, L Willmore, R Tudge, J Mitchell, L Lowe, G Kerry, M Porter, S Fowler, A Simpson, CS Murray

P122 An evaluation of the transition service between paediatric and adult regional severe asthma care in Leeds

C Doyle, E Godinho, A Adams, IJ Clifton, E Guy

P123 Don't forget your PE kit – improving thrombolysis decision making in a District General Hospital (DGH)

J Ayling-Smith, E Grant, H Cranch, E Kealaher, S Eccles, C Williams

P124 Improving safe sedation practices in bronchoscopy at a district general hospital

AE Leadbetter, RG Beckett, CL Marchand, SC Sturney

P125 Audit of complications of percutaneous CT guided lung biopsies carried out at Royal Alexandra Hospital and Inverclyde Royal Hospital in 2019 and 2020

AD Pilkington

P126 Ambulatory pneumothorax with the pleural vent in a DGH in the North East of England

K Jackson, A Aujayeb

P127 Lancashire and South Cumbria Regional Tracheostomy Team: annual impact of a specialist commissioned service

E Forster, K Youd, L Hughes

P128 Development of a pulmonary nodule virtual pathway

S Eccles, A Harries, F Sheel

P129 Getting it right in a digital age – robust patient selection to an early supported discharge service

R Colclough, R Wagstaff, S Rees, K Breese, C Nicholls, S Porter, G Reeves, S Gompertz

10:30-11:50

SPOKEN SESSION: S89 – S93

New insights into airways disease

Chaired by: Dr Alison John (London) and Dr Karl Staples (Southampton)

10:35 **S89**

Comparison of the lung microbiome in chronic obstructive pulmonary disease and in health: an in silico study

B Short, C Delaney, MC Butcher, G Litherland, C Williams, L Martin, K Thornbury, WG Mackay, G Ramage

10:50 **S90***

Comprehensive multiomics analysis demonstrates surfactant dysregulation in COPD

V Hristova, A Watson, M Glover, J Wang, B Angermann, S Ashenden, A Bornot, H Burke, D Cellura, R Chaerkady, A Freeman, A Mackay, D Muthas, S Novick, L Öberg, K Ostridge, A Platt, AD Postle, CM Spalluto, W Yu, S Hess, KJ Staples, TMA Wilkinson

11:05 **S91**

Gateway to the hidden zone: using pCLE to study relationships between elastin remodelling and small airways disease in the COPD lung

KCW Kong, MB Bennett, TH Havelock, KO Ostridge, CMS Spalluto, TW Wilkinson

11:20 **S92**

FeNO non-suppression identifies corticosteroid-resistant type-2 signaling in severe asthma

S Couillard, R Shrimanker, R Chaudhuri, AH Mansur, LP McGarvey, LG Heaney, SJ Fowler, P Bradding, ID Pavord, TSC Hinks

11:35 **S93**

Correlation of eotaxin-3 gene expression and other IL-13-induced genes in patients with asthma

S Couillard, J Melhorn, A Singhania, D Horowitz, R Djukanovíc, CH Woelk, TSC Hinks

***S90 – BTS Medical Student Awards – Winner**

10:30-12:00
SYMPOSIUM

A JOURNEY THROUGH CLOTS, COVID-19 AND CHRONIC THROMBOEMBOLIC DISEASE

Chaired by: Dr Colin Church (Glasgow) and Professor David Kiely (Sheffield)

10:30 COVID-19 and its effects on the pulmonary vasculature: is it here forever?

Dr Laura Price (London)

11:00 The spectrum of chronic thromboembolic disease: is it straight from PE to CTEPH?

Professor Marion Delcroix (Leuven)

11:30 The changing landscape of management of chronic pulmonary thromboembolic disease

Dr John Cannon (Cambridge)

Learning objectives

1) To document the molecular pathways involved in COVID-19 related pulmonary vascular disease and highlight the clinical effects and strategies to try and mitigate those.

2) The molecular mechanisms which are implicated in the transition for acute PE to chronic thromboembolic pulmonary disease and then to CTEPH are discussed. The entity of CTEPD is defined and explored further from a clinical perspective.

3) Recent developments in the management of chronic thromboembolic disease are discussed. This includes evolving roles of surgery and balloon pulmonary angioplasty and pre-treating with pulmonary vasodilators.

10:30-12:00
SYMPOSIUM

LATEST ADVANCES IN IMMUNOTHERAPY FOR LUNG AND PLEURAL MALIGNANCY

Chaired by: Dr Richard Lee (London) and Dr Selina Tsim (Glasgow)

10:30 Latest developments in immunotherapy for treatment of lung cancer

Dr Shereen Rafee (Manchester)

11:00 Dual immunotherapy: a new standard of care in mesothelioma? Discussion of the Checkmate 743 Study

Professor Sanjay Popat (London)

11:30 IO pneumonitis: differential diagnosis, investigation and management

Dr Jaishree Bhosle (London)

Learning objectives

1) Appreciating the rapid advances in IO for lung cancer treatment.

2) Latest trial evidence for IO in mesothelioma.

3) Managing challenging and life-threatening complications.

10:30-12:05
SPOKEN SESSION: S94 – S99

From bench to lung: scientific advances in respiratory research

Chaired by: Dr Simon Hart (Hull) and Dr Elaine Soon (Cambridge)

10:35 **S94**

Elite athletes susceptible to respiratory tract infection are characterised by reduced circulating memory T regulatory cells, upper airway microbial dysbiosis and dysregulation of sphingolipid metabolism

L Cuthbertson, SEG Turner, A Jackson, C Ranson, M Loosemore, P Kelleher, WOC Cookson, MF Moffatt, JH Hull, A Shah

10:50 **S95**

Transcriptional signatures of blood outgrowth endothelial cells from patients with pulmonary arteriovenous malformations and hereditary haemorrhagic telangiectasia

ME Bernabeu Herrero, A Bielowka, D Patel, S Srikaran, P Chaves Guerrero, M Noseda, MA Aldred, CL Shovlin

11:05 **S96**

Pulmonary arteriovenous malformations – genetic versus clinical evidence of underlying hereditary haemorrhagic telangiectasia

L Sharma, A Alsafi, T Ferguson, J Redhead, WL Genomic Medicine Centre, CL Shovlin

11:20 **S97**

Investigating the pro-fibrotic effects of galectins in IPF – a potential role for glycan-mediated interactions with integrins

JF Calver, G Harris, RM Lithgo, R Slack, DJ Scott, RG Jenkins, AE John

11:35 **S98**

Dissecting human pleura at single-cell resolution

J Obacz, TS Adams, JC Schupp, N Kaminski, G Aresu, AS Coonar, A Peryt, DM Rassl, RC Rintoul, SJ Marciniak

11:50 **S99**

Fluorescence-lifetime imaging: a novel diagnostic tool for suspected lung cancer

SE Fernandes, GOS Williams, E Williams, N Finlayson, Q Wang, DA Dorward, C Dhaliwal, WA Wallace, AR Akram, K Dhaliwal

10:30-12:15

POSTER DISCUSSION: P130 – P143

COVID-19 recovery: predicting long term outcomes

Chaired by: Dr Rachael Evans (Leicester) and Ms Ema Swingwood (Bristol)

P130 Prognostic value of the initial chest computerised tomography scan at one year following infection in an ethnically diverse cohort of patients admitted to hospital for COVID-19

D Pan, R Patil, JY Kuah, S Sze, A Bellass, S Assadi, R Machin, DT Barnes, P Rao, J Broznik, CA Martin, J Nazareth, R Evans, S Siddiqui, L Wain, P Haldar, LJ Gray, CE Brightling, I Das, M Pareek

P131 The degree of acute respiratory support with COVID-19 pneumonia, smoking status on admission and non-resolving CT features at three months- are there links?

H Karimzadeh, R Penfold, U Nnajiuba, A Wight

P132 Intermediate follow up of radiological interstitial changes for COVID-19 patients over the first year post discharge: a longitudinal study

JC Gates, A Draper, J Moser, J Arberry, D Jajbhay, J Panaguiton, E Yarham, YE Ong, R Aul

P133 Measuring oxygen saturation on follow up chest X-ray and resolution of radiological changes at 6 to 12 weeks post COVID pneumonitis

A Anwar, E Tubman, W McLean, M Ingram, J Scott-Taggart, C Alexander

P134 Health deprivation and post-COVID fibrosis: is there a relationship and what is the long-term impact?

R Penfold, H Karimzadeh, U Nnajiuba, A Wight

P135 Clinical, functional and psychological characteristics of survivors of severe COVID-19 pneumonia: a comparison of outcomes from the first and second waves

D Griffin, RF D'Cruz, S Mehrotra, P Zamani, F Perrin, A Byrne, S Matthew, M Choudhury, LJ Smith, R Madula, P Cho, T Patrick, D Walder, J Periselneris, J Kavanagh, K Lee, W McNulty, P Macedo, G Warwick, A Heitmann, R Lyall, J Galloway, S Norton, S Birring, A Patel, I Patel, M Waller, CJ Jolley

P136 The relationship between symptoms and functional physiological outcomes in survivors of severe COVID-19 pneumonia

P Zamani, S Mehrotra, D Griffin, RF D'Cruz, S Mathew, A Byrne, M Choudhury, T Fleming, P Cho, D Walder, R Madula, LJ Smith, P Macedo, S Norton, S Birring, A Patel, I Patel, F Perrin, M Waller, CJ Jolley

P137 The impact of ethnicity on the long-term sequelae of COVID-19: follow-up from the first and second waves in North London

SB Naidu, AJ Shah, A Saigal, SE Brill, H Jarvis, JG Goldring, E Wey, D Miller, I Abubakar, JR Hurst, M Lipman, S Mandal

P138 Progress of COVID-19 survivors and the impact of the infection on their ability to return to work

D Siaw Hui Min, M Ahmed, S Mason, A Keegan, P Vetrivel, P Verma, R Huang, Y Ko, C Apthorp, A Twabie, C Moret, H Badri, JL Hoyle

P139 The symptomatology of long COVID patients in Cheshire and Merseyside

S Kimyongur, G Heppenstall-Harris, A Barnes, A Flatt, E Bruchez, M Stolbrink, N Nwosu, L Watkins, G Tack

P140 Does the length of symptoms of long COVID affect perceived dyspnoea?

A Barnes, G Heppenstall-Harris, S Kimyongur, E Bruchez, A Flatt, M Stolbrink, N Nwosu, L Watkins, G Tack

P141 Observational cohort study of patients referred by their GP to a COVID respiratory clinic

H May, R Chamoto, S McConnell, R Stacey, R Horne, A Jefferson, F Leahy, J Holme

P142 Chaotic breathing in post COVID-19 breathlessness: a key feature characterised by approximate entropy

CB Samaranayake, C Warren, S Rhamie, LC Price, C McCabe, G Haji, JH Hull

P143 "It gives you that hope, knowing that you are not alone" – The journey of COVID-19 recovery and the rehabilitation boat

C Gerlis, AC Barradell, NY Gardiner, EJ Chaplin, ACN Watt, SJ Singh, E Daynes

SCIENTIFIC PROGRAMME

12:15-12:30
BTS NEWS BROADCAST
INTERVIEW TIME

Professor Elizabeth Sapey, Chair of the BTS Science and Research Committee, in conversation with the in-coming Chair of the BTS Science and Research Committee, Professor James Chalmers, and the BALR Chair, Dr Karl Staples.

12:30-13:15
GUEST LECTURE
THE BTS GRAND CHALLENGE LECTURE
Child poverty and health inequalities

Professor David Gordon (Bristol)

Introduced by: Rachael Moses (London)

Learning objectives

The COVID-19 pandemic has highlighted the impact of health inequalities both nationally and globally, especially for children. This lecture will outline changing trends in child poverty, and what measures can be taken to 'level up' our society.

13:30-14:40
POSTER DISCUSSION: P144 – P152
Assessing, managing and predicting outcomes in ILD

Chaired by: Dr Felix Chua (London) and Dr Jenny Dickens (Cambridge)

P144 Red Cell Distribution Width (RDW) and Neutrophil Lymphocyte Ratio (NLR) as prognostic markers in Idiopathic Pulmonary Fibrosis (IPF)

R Shuttleworth, T Nancarrow, RL Wollteron, M White, S Lines, J Mandizha, A Duckworth, AM Russell, MA Gibbons, CJ Scotton

P145 Marginal short term lung function changes predict mortality in patients with fibrotic hypersensitivity pneumonitis

C Macaluso, C Boccabella, M Kokosi, V Kouranos, PM George, G Margaritopoulos, PL Molyneaux, F Chua, TM Maher, RG Jenkins, S Desai, A Devaraj, AU Wells, EA Renzoni, CJW Stock

P146 Predictors of adverse outcome in sarcoidosis complicated by pulmonary aspergillosis

L Nwankwo, J Periselneris, D Gilmartin, S Desai, A Shah, V Kouranos, AU Wells, E Renzoni, PL Molyneaux, P George, M Kokosi, A Devaraj, D Armstrong-James, F Chua

P147 Long-term pulmonary function and mortality outcomes in idiopathic pulmonary fibrosis patients treated with antifibrotics

J Barnes, E Harris, L Matos, K Harding, M Thillai

P148 The comorbidome of sarcoidosis

S Gilmour, M Donaghy, P Minnis, E Murtagh

P149 Incidence and prevalence of left-sided heart failure in patients with idiopathic pulmonary fibrosis: a population-based study

A Koteci, AD Morgan, HR Whittaker, L Portas, PM George, JK Quint

P150 Suitability of non-IPF ILD patients for anti-fibrotic therapy – a retrospective cohort study

A Muhammad, M Embley

P151 Assessment of alveolar-capillary membrane permeability using aerosol scintigraphy in diffuse cutaneous systemic sclerosis – a cross sectional study

M Bai, D Prakash Dwivedi, N Pandit, KG Chengappa, A Subathra, R Sivaranjini, G Vishnukanth

P152 Pneumocystis jiroveci pneumonia prophylaxis in patients treated with mycophenolate mofetil for interstitial lung disease

PJ Ireland, L Langlands, C Donaldson, AJ Simpson, IA Forrest, S Wiscombe, W Funston

13:30-14:40

POSTER DISCUSSION: P153 – P161

New treatment pathways in the post-COVID-19 era

Chaired by: Dr Andrew Barlow (Watford) and Dr Carol Kelly (Ormskirk)

P153 A patient centred pathway to support optimal systemic steroid dose reduction after starting biologic therapy in asthma

B Reeve, S Folini, M Tolson, R Harvey, K Harbour, L Wiffen, L Fox, K Tariq, K Babu, AJ Chauhan, T Brown

P154 A pathway transformation to transition from a 'routine' to a 'responsive' severe asthma service in the post COVID era

L Wiffen, R Harvey, L Fox, A Mathias, K Harbour, AJ Chauhan, T Brown

P155 Delivering physiotherapy outpatient assessment and treatment in a severe asthma clinic in the era of COVID-19

C Mason, T Brown, R Harvey, B Reeves, S Folini, M Tolson, L Fox, L Wiffen, AJ Chauhan, R De Vos

P156 A regional study of the availability, uptake and barriers to inhaler recycling: promoting environmental sustainability

K Liatsikos, R Robinson, A Khashkhusha, F Shiham, H Joplin, A Collins, H Burhan

P157 Effectiveness of a multi-disciplinary community respiratory team during the COVID-19 pandemic

E Johnson, E Turner, S Gingles, K Levin, E Mackay, C Roux, M Milligan, M Mackie, K Farrell, K Murray, S Adams, J Brand, D Anderson, H Bayes

P158 Thoracic ultrasound on the respiratory post-take ward round: assessing the impact on clinical decision-making and the patient journey

M Steward, HG Bakere, TG Burden

P159 Outcome from invasive ventilation for patients with learning disability

D McCourt, HM Tedd, TB Fretwell, T Doris, PB Messer

P160 Community respiratory staff in-reach into care homes finds unmet need and allows optimization of patient care plus care home staff education

HS Hill, K Keeling, I Young, J Chandler, MCP Apps

P161 Understanding the role of a patient-led pulmonary fibrosis charity on enabling support groups to thrive: a UK wide survey of support group leaders and members experiences

DA Chand, J Ruck

FRIDAY 26 NOVEMBER 2021

13:30-14:50
SPOKEN SESSION: S100 – S104

Ease that wheeze: managing risk in COPD

Chaired by: Dr Michael Crooks (Hull) and Dr Alexander Mathioudakis (Manchester)

13:35 **S100**

Risk of cardiovascular morbidity and mortality in people with chronic obstructive pulmonary disease versus those without COPD: a structured review of the evidence

H Müllerová, Z Marjenberg, J Marshall, E de Nigris, P Varghese, N Pooley, N Embleton

13:50 **S101**

Methods for assessing the success or failure of COPD exacerbation treatments in therapeutic clinical trials: a meta-epidemiological systematic review

AG Mathioudakis, S Ananth, T Bradbury, B Csoma, GF Romero, G Criner, C Jenkins, PR Williamson, JU Jensen, J Vestbo

14:05 **S102**

The under recognised role of moderate eosinophilia on exacerbation frequency In COPD patients: a single centre study

P Dobson, A Dewar

14:20 **S103**

The provision of the five fundamentals of COPD care – findings from a UK-wide survey of people with COPD

A Cumella, A Cook

14:35 **S104**

Cost-effectiveness of triple therapy with budesonide/glycopyrronium/formoterol fumarate versus dual therapies in moderate-to-very severe COPD in the United Kingdom: analysis based on the KRONOS study

E de Nigris, U Holmgren, C Treharne, N Brighton, A Walker, J Haughney

13:30-14:55
POSTER DISCUSSION: P162 – P172

Topics in thoracic malignancies

Chaired by: Dr Sophia Antoniou (London) and Dr Robert Rintoul (Cambridge)

SCIENTIFIC PROGRAMME

P162 Preparing Wales for lung cancer screening – selecting a search strategy for inclusion

JS Engela-Volker, SR Eccles

P163 Preparing Wales for lung cancer screening – updating GP record smoking data using an automated text message system

JS Engela-Volker, SR Eccles

P164 Outcome of lung nodule surveillance: a brief retrospective review of a cohort of patients followed-up according to BTS guidelines

A Perez Augusto, S Datta, Y Ling, L McClure, D Grieve, M Majury

P165 The 'suspicious' chest X-ray. How good are we at distinguishing high-risk from low-risk abnormalities?

JH Noble, A Rehman, H Steer

P166 Contrast enhanced PET-CT. Development and experience of a novel imaging pathway in suspected lung cancer

J McKeon, JH Noble, I Lyburn, H Steer

P167 Evaluation of EBUS service-delivery across the UK: a nationwide survey

S Hassan, K Ur Rehman, R Baghai-Ravary

P168 Endobronchial ultrasound-guided transbronchial needle aspiration for asymptomatic or incidental bilateral hilar or mediastinal adenopathy: an unnecessary test?

A Begbey, J Karimjee, N Piletska, A Nasir, T Loke

P169 An update on the STRATIFY (Staging by Thoracoscopy in Potentially Radically Treatable Non-Small Cell Lung Cancer Associated with Minimal Pleural Effusion) study

J Ferguson, N Rahman, N Maskell, J Lyons, S Grundy, D Sivakumar, J Corcoran, D Menzies, A Chalmers, L Alexander, C Kelly, A Shaw, C Dick, S Tsim, G Cowell, T Hopkins, R Woodward, KG Blyth

P170 Pleural recurrence after transthoracic needle lung biopsy in stage I lung cancer

K Jackson, O Kent, C Storey, E Pang, M Hadi, S VijayaGopal, A Aujayeb

P171 SABR: acceptable and efficacious: a 7 year experience from a North East hospital

A Aujayeb

P172 Indwelling pleural catheter removal and auto-pleurodesis: predictors and outcome

DN Addala, EO Bedawi, A Sundaralingam, R Banka, M Ellayeh, N Kanellakis, Y Zhao, NM Rahman

13:30-14:55

POSTER DISCUSSION: P173 – P183

Perspectives on education, training and research collaboration

Chaired by: Dr Lola Loewenthal (London) and Dr Daniel Smith (Nottingham)

P173 Mind the gap! Research experience of respiratory trainees – a National survey

V Randles, T Jones, NM Rahman, T Harman, A De Soyza

P174 Research for all: the impact of NWCORR, a trainee research collaborative

V Randles, P Bradley, L Pearmain, F Frost, A Ashish

P175 Bronchoscopy training in Scotland: feedback from respiratory trainees during the SARS-CoV-19 pandemic

K Sharma, F Catterall, J Maclay, J Van Der Horst

P176 The restructuring and development of a respiratory in-reach consultation service staffed by advanced clinical practitioners

A Lee, B Jenkinson

P177 Are ward rounds a source of learning? Trainees perception of learning knowledge, skills or attitude during ward rounds in a large tertiary care hospital

A Khan, H Jahdali, AS Harbi, S Al Yami, A Mutairi, H Sher

P178 Evaluating medical students' telephone clerkings in the respiratory placement

N Rasmussen, M Yakoub, F Simpson-Orlebar, N Marks

P179 A year in COVID – looking at the mental and physical health of Respiratory High Care Unit (RHCU) staff throughout the COVID-19 pandemic

J Reece, R O'Neill, A Lal, SL Tan

P180 The viability and acceptability of a respiratory physiotherapy weekend late shift service: a service evaluation

A Lockwood, E Douglas, T Harvey-Dunstan

P181 Financial benefits of a dedicated pulmonary nodule multidisciplinary team meeting: experience from a district general hospital in the United Kingdom

P Ayuen, A Khan, C Butter, R Davies, C Ashwin, S Saikia

P182 What makes a hero?

K Crowley, I Du Rand

P183 Acute NIV: a simulation based QIP for internal medical trainees

W Hassan, D Sagar, A Hamad

13:30-15:00

SYMPOSIUM

PULMONARY INFECTION HORIZON-SCANNING: WHAT COULD GO WRONG NOW?

Chaired by: Professor Alison Condliffe (Sheffield) and Dr Anand Shah (London)

13:30 The global emergence of antifungal resistance: the calm before the storm?

Professor Matthew Fisher (London)

14:00 Precision medicine in infectious disease: is a system genomic approach the answer?

Dr Myrsini Kaforou (London)

14:30 Accelerated immune ageing in severe COVID-19 infection

Dr Niharika Duggal (Birmingham)

Learning objectives

1) Insight into the rapid global spread of antifungal resistance and the use of whole genome sequencing to identify mechanism of evolution. Awareness of novel diagnostics in development for rapid detection and implications for therapeutic options.

2) Understand how a system genomic approach can be used to define specific pathway defects in infectious disease and primary immunodeficiency. Insight into how this can translate into novel precision medicine therapy.

3) Understanding of the effects of ageing on the host response to viral and bacterial responses. Review of potential therapeutic strategies to augment host immunity within an ageing population.

FRIDAY 26 NOVEMBER 2021

13:30-15:30
SYMPOSIUM

THE ASTHMA SCIENCE SYMPOSIUM: DEEP PHENOTYPING INTO ACTIONABLE INSIGHTS

Chaired by: Professor Sebastian Johnston (London) and Dr Tara Sutherland (Manchester)

13:30 Targeting treatable traits in severe asthma
Professor William Busse (Wisconsin)

14:00 The human lung cell atlas: mapping cell types to tissues context
Dr Kerstin Meyer (Cambridge)

14:30 Asthma and the microbiome
Professor Geraint Rogers (Adelaide)

15:00 Asthma and COVID-19: comparing rhinovirus and SARS-CoV2
Professor Sebastian Johnston (London)

Learning objectives

1) To understand how to focus asthma treatments in severe disease based by biological signals.

2) To learn how novel methodologies have identified new cell types and how this might lead advances in clinical care.

3) To understand the relationship between the lung microbiome and outcomes in asthma.

4) To compare the impact and biology of SARS-CoV2 and rhinovirus infections in asthma.

15:15-16:45
SYMPOSIUM

AIR POLLUTION: THE GREATEST ENVIRONMENTAL HEALTH RISK OF OUR TIME

Chaired by: Dr Gary Fuller (London) and Professor Anna Hansell (Leicester)

15:15 The sources and atmospheric dynamics of air pollution
Dr Matthew Hort (Met Office)

15:35 The health impacts of air pollution across the life-course
Professor Frank Kelly (London)

15:55 Why Ella Kissi-Debrah's new inquest was so important
Professor Sir Stephen Holgate (Southampton)

16:10 Air pollution: what needs to be done
Rosamund Adoo Kissi-Debrah (Air Pollution and Asthma Campaigner)

16:25 The role of health professionals in tackling air pollution
Dr Jenny Baverstock (Southampton)

Learning objectives

Many people believe that the air pollution, at current levels, is not a problem following the Clean Air Acts of the 1950-60s. How wrong this is. Modern air pollution is largely invisible and odourless – out of sight out of mind – and is emitted from multiple sources linked to human activities, especially combustion. This is why the WHO now regards air pollution as such a major public health problem. In this session we will learn about sources of emissions and human exposures, the many health effects this drives across the life-course, the way that Ella Kissi-Debrah's second inquest identifying how air pollution was so important to her asthma origins, progression, and eventual death, and from Ella's courageous mother, why this landmark decision by the coroner is such an important watershed for action as described in his Prevention of Future Deaths Report. Finally, what health professionals need to do to take greater ownership of the problem and then become advocates for cleaning up the air we breathe that is essential for life. For tobacco smoking, health professionals played a key role in the emergence of new regulations, we need the same level of commitment to now focus on air pollution.

15:15-17:15
SYMPOSIUM

MACHINE LEARNING AND DATA SCIENCE TO IMPROVE PATIENT CARE

Chaired by: Dr Joseph Jacob (London) and Dr Muhunthan Thillai (Cambridge)

15:15 Computer science
Professor Daniel Alexander (London)

15:45 Lung nodules
Dr Colin Jacobs (Nijmegen)

16:15 ILAs and the potential implications for AI/ML
Dr Rachel Putman (Boston)

16:45 Parametric response mapping in COPD
Dr George Washko (Cambridge, Massachusetts)

Learning objectives

1) An introduction to AI and ML for the respiratory physician.

2) Understand the application of ML in the detection and monitoring of pulmonary nodules.

3) Understand the application of ML in assessing and monitoring ILA.

4) Understand the application of ML in the diagnosis, prognostication and monitoring of COPD.

15:30-16:30
POSTER DISCUSSION: P184 – P190

Fighting back: optimising treatment for COVID-19

Chaired by: Dr Jonathan Fuld (Cambridge) and Dr Katie Jeffery (Oxford)

P184 Is Continuous Positive Airway Pressure (CPAP) effective in the management of COVID-19 in patients aged 75 and over? A retrospective observational study of a respiratory COVID-19 CPAP unit through its second wave

H Alexander, R McGow, S Makwana, S Al-Hakeem, A Adeyeye, A Ashish

P185 Experience of using high flow nasal oxygen first line to treat hypoxemic respiratory failure due to COVID-19 in patients in whom critical care admission was felt to be not of benefit on a respiratory support unit (RSU) from October 2020 to March 2021

DA Tarpey, S Woods, S Jain

P186 Single centre experience of Tocilizumab in COVID-19 pneumonia

Y Maung Maung Myint, R Goodka, M Mehta, S Ananth, H Ghani, R Vancheeswaran

P187 Clinical outcomes and treatment-related adverse events to Tocilizumab in SARS-CoV-2 illness

S Ahmad, E Jenkinson, R Carney, T Nahu, J Quinn, A Dwarakanath

P188 Tick tock... where and when can we give toc? Review of COVID-19 patients receiving tocilizumab in a non-critical care setting

K Aiken, M Wilson, E Keelan

P189 Use of angiotensin-converting-enzyme inhibitors and angiotensin receptor blockers in COVID-19 infection does not adversely affect clinical outcomes including need for non-invasive and invasive ventilation

A Amrapala, M Win, A Ainley

P190 The impact of drug therapies on COVID-19 mortality in a UK tertiary centre

T Kurmoo, M Mayisha Ahmad, R Wang, N Chaudhuri

15:30-16:40
POSTER DISCUSSION: P191 – P199

Perspectives on pleural disease

Chaired by: Professor Najib Rahman (Oxford) and Dr Elizabeth Sage (Inverness)

P191 The biochemistry of 'non-specific pleuritis'

A Sundaralingam, D Addala, EO Bedawi, R Hallifax, V George, R Banka, MA Ellayeh, N Kanellakis, J Wrightson, NM Rahman

P192 A training programme for ward based respiratory nurses on chest drain care and management

K James, A Thottiyil Joseph, J Storey, AO Clive

P193 Complications after thoracocentesis and small bore intercostal drain insertion: a single centre study from the North East of England

K Jackson, A Aujayeb

P194 Septation formation following pleural intervention

H Rai, N Sarnrak, E Graham, A Ghoshal, T Nicholson, LM Taylor, JP Corcoran, C Daneshvar

P195 Pleural effusions associated with pericarditis or myocarditis

R Ahmed, R Scott, K Jackson, A Aujayeb

P196 Pneumothorax and cardiac device implantation: a 10 year retrospective review from a single centre in the North East of England

K Jackson, C Storey, M Carling, R Davidson, G George, O Kent, A Aujayeb

P197 Secondary spontaneous pneumothorax: examining the equipoise

S Walker, E Carlton, N Maskell

P198 Outcomes of autologous blood pleurodesis in persistent air leak: an eight-year retrospective study

K Ur Rehman, L Okiror, P Sivakumar

P199 The role of multi-level intercostal nerve block in Local Anaesthetic Thoracoscopy (LAT)

S Ajmal, D Walker, S Johnstone, E Caruana, M Tufail, RK Panchal

15:30-16:45

POSTER DISCUSSION: P200 – P209

Asthma: phenotyping and the response to biologics

Chaired by: Dr Binita Kane (Manchester) and Professor Adel Mansur (Birmingham)

P200 Urinary leukotriene E4 as a biomarker in NSAID exacerbated respiratory disease (N-ERD): a systematic review and meta-analysis

B Tailor, M Marquette, PC Calder, PJ Curtis, AM Wilson

P201 To what extent does the prototype ORACLE scale predict treatment benefits? Predicted versus observed impact of anti-inflammatory treatments

S Couillard, WIH Do, R Beasley, A Laugerud, M Jabeen, S Ramakrishnan, J Melhorn, TSC Hinks, ID Pavord

P202 Real life experience with mepolizumab and comparison with omalizumab in children with severe asthma

J Ko, A Jamalzadeh, S Makhecha, S Saglani, A Bush, L Fleming

P203 Effectiveness of anti-IL4R therapy following Suboptimal Response to anti-IL5/5R therapy in severe eosinophilic asthma

TW Mason, AP Hearn, G d'Ancona, M Fernandes, C Roxas, L Green, L Thomson, J Dhariwal, AM Nanzer, DJ Jackson

P204 COVID-19 in the absence of eosinophils: a case series of confirmed infection whilst on treatment with benralizumab

CHR Francis, AP Hearn, S Ratnakumar, A Taylor, J Duckitt, U Ahmed, J Dhariwal, AM Nanzer, DJ Jackson

P205 Elective inpatient systematic evaluation of difficult to treat asthma; case series demonstrating the clinical value and improved patients outcomes

A Cass, AH Mansur

P206 Utility of adherence checks in patients with severe asthma eligible for biologics: a single centre retrospective analysis

ME Oliver, S Poole, C Borg, C Connolly, ID Pavord, TSC Hinks, S Couillard

P207 Steroid reduction with omalizumab in severe allergic asthma

L Elsey, A Jefferson, SJ Fowler, L Maguire, S Khurana, CT Pantin

P208 Does obesity affect fractional exhaled nitric oxide interpretation in difficult asthma?

V Sharma, HC Ricketts, A Goodfellow, F Steffensen, DC Cowan

P209 Treatable traits in diagnosis-naïve and untreated patients with suspected asthma – data from the RADICA study

R Wang, I Choudhury, L Healy, S Drake, L Willmore, J Mitchelle, R Tudge, A Simpson, CS Murray, SJ Fowler

15:30-16:55

POSTER DISCUSSION: P210 – P220

Oxygen, CPAP, NIV or ICU: what works in COVID-19?

Chaired by: Mrs Rachael Moses (London) and Dr Mohan-pal Singh Chandan (Birmingham)

P210 Not all COVID-19 deaths are hypoxic: observational cohort study of patients who died at the Nightingale Hospital Exeter

KL Adams, C Fearnley, R Mankiewitz, J Hubbard, W Reed, T Whitehead, L Anning

P211 Comparing outcomes and characteristics of COVID-19 patients treated with CPAP inside and outside of the intensive care unit

DL Sykes, R Martin, MG Crooks, K Thuthu, OI Brown, TJP Tyrer, A Aji, P Gunasekera, S Faruqi

P212 Non-invasive respiratory support in adults with COVID-19 who are not for intubation: the balance between saving lives and prolonging death

SB Naidu, ASC Lawrence, A Kirupananthavel, A Nijhawan, A Gupta, J Fretwell, TL Sutton, K Matsumoto, Z Thursz, DJ Hobden, A Saleh, F Rashid, I Whelan, M Darmalingam

P213 Factors influencing outcome in COVID-19 patients requiring respiratory support – a single centre experience from West Midlands

S Irshad, D Puntan, S Butt, Z Ansari, N Nathani, A Razak

P214 COVID-19 mortality rates in a district general respiratory support unit

A Yousuf, M Selvan, SH Lee, P Hawkins, R Badiger

P215 A retrospective observational study of COVID-19 patients on a Respiratory High Care Unit (RHCU)

R O'Neill, J Reece, A Lal, M Saeed, SL Tan

P216 COVID-19 and ethnicity: how does it impact admission to intensive care and use of CPAP?

A Krishna, R Naran, R Young, A Ainley

P217 Improved COVID-19 outcomes in a large non-invasive respiratory support cohort despite new variants

BML Porter, CD Turnbull, SB Evans, O Smith, R Lardner, RJ Hallifax, HV Bettinson, NP Talbot, M Bafadhel, NM Rahman, N Petousi

P218 A tale of two waves: a single centre retrospective cohort study assessing mortality in severe COVID-19 in first and second waves

B Iqbal, D Jose, T Buttle

P219 Challenges with end-of-life care in COVID patients requiring non-invasive respiratory support

RE Nixon, SB Naidu, J Fretwell, K Matsumoto, F Rashid, T Sutton, Z Thursz

P220 Assessing the multi-disciplinary team response to NIV withdrawal guidelines in patients with COVID-19

A Birtles, K Gaffney, G Mullen, A Boland

15:45-17:30

SYMPOSIUM

TO VAPE OR NOT TO VAPE, THAT IS THE QUESTION

Chaired by: Dr Nazia Chaudhuri (Manchester) and Dr Aaron Scott (Birmingham)

15:45 Acute effects of e-cigarettes on the innate immune response

Dr Aaron Scott (Birmingham)

16:10 E-cigarette constituents propylene glycol and vegetable glycerin, decrease glucose uptake and its metabolism in airway epithelial cells in vitro

Professor Deborah Baines (London)

16:35 Cochrane review of e-cigarettes for smoking cessation

Dr Jamie Hartmann (Oxford)

17:00 How close are we to definitively identifying the respiratory health effects of e-cigarettes?

Dr Maciej Goniewicz (New York)

Learning objectives

1) Are e-cigarettes effective as a cessation therapy?

2) Discuss the immunological effects of e-cigarettes use.

3) Discussion of non-nicotine e-cigarette effects in the context of metabolism.

4) Based on cohort studies carried out by Dr Goniewicz, how close are we now to quantifying the effects of e-cigarette use?

17:30-18:00

BTS NEWS BROADCAST

TWILIGHT HIGHLIGHTS

A live, entertaining discussion and review of the day's sessions, and highlights not to miss on demand after the Meeting ends.

ARIKAYCE LIPOSOMAL 590 MG NEBULISER DISPERSION (AMIKACIN SULFATE) - ABBREVIATED PRESCRIBING INFORMATION (API)

Prescribers are recommended to consult the summary of product characteristics before prescribing. **Presentations** Each vial contains amikacin sulfate equivalent to 590 mg amikacin in a liposomal formulation. The mean delivered dose per vial is approximately 312 mg of amikacin. **Indication** Arikayce is indicated for the treatment of non-tuberculous mycobacterial (NTM) lung infections caused by Mycobacterium avium Complex (MAC) in adults with limited treatment options who do not have cystic fibrosis. Consideration should be given to official guidance on the appropriate use of antibacterial agents. **Posology and method of administration** Arikayce recommended dosage: one vial (590 mg) administered once daily by oral inhalation. Duration of treatment: Treatment with Arikayce, as part of a combination antibacterial regimen, should be continued for 12 months after sputum culture conversion. Treatment should not continue beyond a maximum of 6 months if sputum culture conversion (SCC) has not been confirmed by then. The maximum duration of treatment should not exceed 18 months. Hepatic/renal impairment: Arikayce has not been studied in patients with hepatic or renal impairment. No dose adjustments based on hepatic impairment are required since amikacin is not hepatically metabolised. Use is contraindicated in severe renal impairment. Paediatrics: The safety and efficacy of Arikayce in paediatric patients below 18 years of age have not been established. No data are available. Missed doses: If a daily dose of Arikayce is missed, the next dose should be administered the next day. A double dose should not be given to make up for the missed dose. Method of administration: Arikayce is for inhalation use only. Arikayce must only be used with the Lamira Nebuliser System (nebuliser handset, aerosol head and controller). It must not be administered by any other route or using any other type of inhalation delivery system. Refer to full SmPC for full information on posology and administration. **Contraindications** Hypersensitivity to active substance, to any aminoglycoside antibacterial agent, or any excipient. Hypersensitivity to soya. Co-administration with any aminoglycoside administered via any route of administration. Severe renal impairment. **Special warnings and precautions for use** Anaphylaxis and hypersensitivity reactions: Serious and potentially life-threatening hypersensitivity reactions, including anaphylaxis, have been reported in patients taking inhaled liposomal amikacin. Allergic alveolitis: Allergic alveolitis and pneumonitis have been reported with the use of inhaled liposomal amikacin. Bronchospasm: Bronchospasm has been reported with the use of inhaled liposomal amikacin. Exacerbation of underlying pulmonary disease: In clinical trials, exacerbation of underlying pulmonary disease (chronic obstructive pulmonary disease, infective exacerbation of chronic obstructive pulmonary disease, infective exacerbation of bronchiectasis) was reported with a higher frequency in patients treated with inhaled liposomal amikacin. Ototoxicity: In clinical trials, ototoxicity (including deafness, dizziness, presyncope, tinnitus, and vertigo) was reported with a higher frequency in patients treated with inhaled liposomal amikacin. Nephrotoxicity: Nephrotoxicity was reported in clinical trials in patients treated with inhaled liposomal amikacin. Renal function should be monitored periodically during treatment in all patients and frequent monitoring is advised in patients with pre-existing renal dysfunction. Neuromuscular blockade: In clinical trials, neuromuscular disorders (reported as muscle weakness, neuropathy peripheral and balance disorder) have been reported with inhaled liposomal amikacin. Use of inhaled liposomal amikacin in patients with myasthenia gravis is not recommended. Refer to full SmPC for further information on warnings and precautions. **Interaction with other medicinal products and other forms of interaction** No clinical drug interaction studies have been conducted with inhaled liposomal amikacin. Co-administration of inhaled liposomal amikacin with any aminoglycoside administered by any route is contraindicated. Co-administration with any other medicinal product affecting auditory function, vestibular function or renal function (including diuretics) is not recommended. Concurrent and/or sequential use of inhaled liposomal amikacin is not recommended with other medicinal products with neurotoxic, nephrotoxic or chelatic potential that can enhance aminoglycoside toxicity (e.g. diuretic compounds such as ethacrynic acid, furosemide or intravenous mannitol). Refer to full SmPC for further information on interactions. **Fertility, pregnancy and lactation** Human data on use during pregnancy or lactation are not available. No fertility studies were conducted with inhaled liposomal amikacin. **Effects on ability to drive and use machines** Amikacin has minor influence on the ability to drive and use machines. The administration of inhaled liposomal amikacin can cause dizziness and other vestibular disturbances. **Undesirable effects** The most commonly reported respiratory adverse reactions were dysphonia, cough, dyspnoea, haemoptysis, oropharyngeal pain, and bronchospasm. Other commonly reported non-respiratory adverse reactions included fatigue, diarrhoea, infective exacerbation of bronchiectasis, and nausea. Most common serious adverse reactions included Chronic Obstructive Pulmonary Disease (COPD), haemoptysis, and infective exacerbation of bronchiectasis. Refer to full SmPC for further information on undesirable effects. **Overdose** Adverse reactions specifically associated with overdose of inhaled liposomal amikacin have not been identified in clinical trials. Overdose in subjects with pre-existing impaired renal function, deafness or vestibular disturbance, or impaired neuromuscular transmission may develop worsening of the pre-existing disorder. Refer to full SmPC for further information on overdose.

Legal Category: Prescription only medicine

Pack quantities and costs: Pack size of 28 vials. The carton also contains the Lamira Nebuliser Handset and 4 aerosol heads. £2513 / €2,510.70 per pack

Marketing Authorisation Holder: Insmed Netherlands B.V., Stadsplateau 7, 3521 AZ Utrecht, Netherlands

Marketing Authorisation Number: EU/1/20/1469/001

Ireland: Adverse events should be reported. Healthcare professionals are asked to report any adverse events involving ARIKAYCE LIPOSOMAL 590 MG via HPRA Pharmacovigilance, website: www.hpra.ie. Adverse events should also be reported via safety@insmed.com

United Kingdom: Adverse events should be reported. Reporting forms and information can be found at www.mhra.gov.uk/yellowcard or search for MHRA Yellow Card in Google play or Apple App store. Adverse events should also be reported via safety@insmed.com

Date of last revision of the API text Oct 2020 Ref 3903

† ARIKAYCE liposomal is an add-on therapy to oral guideline-based therapy (GBT); failure on oral GBT is defined as failure to culture convert despite ≥6 months GBT with three oral antibiotics.

* In the CONVERT study in patients who failed to convert after ≥6 months oral GBT, 29.0% (65/224) patients on ARIKAYCE liposomal + oral GBT vs 8.9% (10/112) patients treated with oral GBT alone achieved culture conversion (P<0.0001).[6] Sustained culture conversion for those on ARIKAYCE liposomal + oral GBT was seen 18.3% (41/224) patients vs 2.7% (3/112) on oral GBT alone.[7] Durable conversion when all therapy was discontinued was observed after 3 months in 16.1% (36/224) ARIKAYCE liposomal + oral GBT patients vs 0% oral GBT alone.[6]

References: 1. Malinin V et al. Antimicrob Agents Chemother 2016;60:6540-49; 2. Zhang J et al. Front Microbiol 2018;9:915; 3. Daley CL et al. Eur Respir J 2020;56:2000535; 4. Griffith DE et al. Am J Respir Crit Care Med 2018;198:1559-69; 5. ARIKAYCE liposomal. Summary of Product Characteristics October 2020; last accessed October 2020 6. Olmer KN et al. Am J Respir Crit Care Med 2017;195:814-23; 7. Insmed Incorporated, Bridgewater, NJ, USA. Data on file, CONVERT study final CSR 2019

 Date of Preparation: October 2020. PP-ARIK-UK-00025

insmed®

A direct way to treat MAC-PD[1,2]

ARIKAYCE® liposomal delivers amikacin to the site of infection within the lung macrophages

Recommended by Guidelines

Use of ARIKAYCE liposomal is strongly recommended by guidelines in patients where ≥6 months GBT fails to provide culture conversion[3†*]. 3x more patients culture converted with ARIKAYCE liposomal + oral GBT than with oral GBT alone[4,5]

Durable Culture Conversion

Durable culture conversion in CONVERT at 3 months off treatment was achieved by 16.1% [36/224] vs. 0% [0/112]; p-value <0.0001 in Arikayce plus GBT arm vs GBT alone arm[5]

Safety Profile

Evaluated in >400 patients,[4,6] AEs were mostly respiratory in nature, 87.4% and 50.0% of patients in the ALIS plus GBT and GBT alone arms respectively[4]

ARIKAYCE liposomal is indicated for the treatment of non-tuberculous mycobacterial (NTM) lung infections caused by *Mycobacterium avium* Complex (MAC) in adults with limited treatment options who do not have cystic fibrosis. ARIKAYCE liposomal treatment should be initiated and managed by physicians experienced in the treatment of non-tuberculous lung disease due to *Mycobacterium avium* Complex.

ARIKAYCE® LIPOSOMAL
amikacin sulphate
590 mg nebuliser dispersion

Now accepted for restricted use within NHSScotland SMC2317[2]

The first biologic for the treatment of severe asthma to inhibit IL-4 and IL-13 signalling in patients 12 years and older as add-on maintenance treatment for severe asthma with type 2 inflammation characterised by raised blood eosinophils and/or raised FeNO, who are uncontrolled with high dose ICS plus another medicinal product for maintenance treatment.[1]

Visit the **SANOFI GENZYME** virtual booth at **BTS Winter** to learn more

Prescribing Information Great Britain:

Prescribing Information: Dupixent® (dupilumab) solution for injection in pre-filled syringe or pen (Asthma). Please refer to the Summary of Product Characteristics (SmPC) before prescribing.

Presentations: Dupixent 200 mg solution for injection in a pre-filled syringe or pen, containing 200 mg of dupilumab in 1.14 ml solution (175 mg/ml) or Dupixent 300 mg solution for injection in a pre-filled syringe or pen, containing 300 mg of dupilumab in 2 ml solution (150 mg/ml). **Indication:** Dupixent is indicated in adults and adolescents (>=12 years old) as add-on maintenance treatment for severe asthma with type 2 inflammation characterised by raised blood eosinophils and/or raised fraction of exhaled nitric oxide (FeNO), who are inadequately controlled with high dose ICS plus another medicinal product for maintenance treatment. **Dosage and Administration:** Treatment should be initiated by healthcare professionals experienced in the diagnosis and treatment of asthma. Dupixent should be administered as subcutaneous (SC) injection, into the thigh or abdomen, except for the 5 cm around the navel. A patient may self-inject dupilumab or the patient's caregiver may administer dupilumab if their healthcare professional determines that this is appropriate. Proper training should be provided to patients and/or caregivers on the preparation and administration of dupilumab prior to use according to the Instructions for Use (IFU). The upper arm can be used as an injection site if not self-injecting. It is recommended to rotate the injection site with each injection and it should not be injected into skin that is tender, damaged or has bruises or scars. ***Adults and adolescents:*** an initial dose of 400mg (two 200mg injections), followed by 200mg EOW. ***Patients with severe asthma, who are on oral corticosteroids or, have co-morbid moderate-to-severe atopic dermatitis, or adults with co-morbid severe chronic rhinosinusitis with nasal polyposis:*** an initial dose of 600mg (two 300mg injections consecutively in different injection sites), followed by 300mg every other week (EOW). Patients receiving concomitant oral corticosteroids may reduce their steroid dose once clinical improvement with dupilumab has occurred. Steroid reductions should be accomplished gradually. Dupilumab is intended for long-term treatment. The need for continued therapy should be considered at least on an annual basis as determined by physician assessment of the patient's level of asthma control. ***Missed dose:*** If a dose is missed, administer the dose as soon as possible. Thereafter, resume dosing at the regular scheduled time. **Special populations:** *Elderly (≥ 65 years):* No dose adjustment recommended. *Renal impairment:* No dose adjustment in patients with mild or moderate renal impairment. Very limited data available in patients with severe renal impairment. *Hepatic impairment:* No data available. *Body weight:* No dose adjustment is recommended for patients with asthma ≥12 years.. **Contraindications:** Hypersensitivity to the active substance or to any of the excipients. Warnings and Precautions: Dupilumab should not be used to treat acute asthma symptoms, acute exacerbations, acute bronchospasm or status asthmaticus. Systemic, topical, or inhaled corticosteroids should not be discontinued abruptly upon initiation of therapy with dupilumab. Reductions in corticosteroid dose, if appropriate, should be gradual and performed under the direct supervision of a physician. Reduction in corticosteroid dose may be associated with systemic withdrawal symptoms and/or unmask conditions previously suppressed by systemic corticosteroid therapy. Biomarkers of type 2 inflammation may be suppressed by systemic corticosteroid use. This should be taken into consideration to determine type 2 status in patients taking oral corticosteroids. **Traceability:** In order to improve the traceability of biological medicinal products, the name and the batch number of the administered product should be clearly recorded. **Hypersensitivity:** If a systemic hypersensitivity reaction (immediate or delayed) occurs, administration of Dupixent should be discontinued immediately and appropriate therapy initiated. Cases of anaphylactic reaction, angioedema and serum sickness/serum sickness-like reaction have been reported. Anaphylactic reactions and angioedema have occurred from minutes to up to seven days after the dupilumab injection. **Eosinophilic conditions:** Cases of eosinophilic pneumonia and vasculitis, consistent with eosinophilic granulomatosis with polyangiitis (EGPA) have been reported. Physicians should be alert to vasculitic rash, worsening pulmonary symptoms, cardiac complications, and/or neuropathy presenting in their patients with eosinophilia. Patients may present with serious systemic eosinophilia sometimes presenting with clinical features of eosinophilic pneumonia or vasculitis consistent with eosinophilic granulomatosis with polyangiitis. Often these conditions are treated with systemic corticosteroid therapy. These events usually, but not always, may be associated with the reduction of oral corticosteroid therapy. **Helminth infection:** Patients with known helminth infection were excluded from the clinical trials. Dupixent may influence the immune response against helminth infections by inhibiting IL-4/IL-13 signaling. Patients with pre-existing helminth infections should be treated before initiating Dupixent. If patients become infected while receiving treatment with Dupixent and do not respond to anti-helminth treatment, treatment with Dupixent should be discontinued until infection resolves. **Conjunctivitis and keratitis related events:** Conjunctivitis and keratitis related events have been reported with dupilumab, predominantly in atopic dermatitis patients. Some patients reported visual disturbances (e.g. blurred vision) associated with conjunctivitis or keratitis. Patients should be advised to report new onset or worsening eye symptoms to their healthcare provider. Patients treated with Dupixent who develop conjunctivitis that does not resolve following standard treatment or signs and symptoms suggestive of keratitis should undergo ophthalmological examination, as appropriate. **Atopic dermatitis or CRSwNP patients with comorbid asthma:** Patients on dupilumab for moderate-to-severe atopic dermatitis or severe CRSwNP who also have comorbid asthma should not adjust or stop their asthma treatments without consultation with their physicians. Patients with comorbid asthma should be monitored carefully following discontinuation of Dupixent. **Vaccinations:** Live and live-attenuated vaccines should not be given concurrently with Dupixent as clinical safety and efficacy has not been established. It is recommended that patients should be brought up to date with live and live-attenuated immunisations in agreement with current immunisation guidelines prior to treatment with Dupixent. **Sodium content:** This medicinal product contains less than 1mmol sodium (23mg) per 300mg dose, i.e. essentially "sodium-free". **Interactions:** Patients receiving Dupixent may receive concurrent inactive or non-live vaccinations. One study evaluating the pharmacokinetic effects of Dupixent on CYP substrates did not indicate clinically relevant effects of Dupixent on CYP1A2, CYP3A, CYP2C19, CYP2D6 or CYP2C9 activity. **Fertility, pregnancy and lactation:** Animal studies do not indicate direct or indirect harmful effects with respect to reproductive toxicity. There are limited data from the use of Dupixent in pregnant women. Animal studies do not indicate harmful effects. Dupixent should be used during pregnancy only if the potential benefit justifies the potential risk to the foetus. It is unknown whether Dupixent is excreted in human milk or absorbed systemically after ingestion. A decision must be made whether to discontinue breast-feeding or to discontinue Dupixent therapy taking into account the benefit of breast feeding for the child and the benefit of therapy for the woman. **Adverse Reactions:** ***Common (≥1/100 to <1/10):*** Arthralgia, conjunctivitis*, conjunctivitis allergic*, eosinophilia, injection site reactions (erythema, oedema, pruritis, pain, and swelling), oral herpes*. ***Uncommon (≥ 1/1,000 to < 1/100):*** Angioedema, blepharitis*†, eye pruritis*†, keratitis*. ***Rare (≥ 1/10,000 to < 1/1,000):*** Anaphylactic reaction, serum sickness reaction, serum sickness-like reaction, ulcerative keratitis*†. *Eye disorders and oral herpes occurred predominantly in atopic dermatitis studies. †The frequencies for eye pruritis and blepharitis were common and ulcerative keratitis was uncommon in atopic dermatitis studies. ***Serious adverse reactions:*** eczema herpeticum and immunogenicity have also been reported. ***Adolescents (12-17 years):*** The safety profile of Dupixent in adolescents aged 12-17 years followed through week 52 and through a long-term study was similar to the safety profile from studies in adults with asthma. For full details please consult the SmPC. **Legal Classification:** POM. **List Price UK:** 4 week pack containing 2 x pre-filled syringes or pens: £1,264.89. 12 week pack containing 6 x pre-filled syringes £3,794.66. **List Price IE:** Price on Application. **Marketing Authorisation Holder:** Aventis Pharma Ltd, 410 Thames Valley Park Drive, Reading, Berkshire, RG6 1PT, UK. **Marketing Authorisation Numbers:** 2 x 200 mg pre-filled syringe: PLGB 04425/0874; 2 x 300 mg pre-filled syringe: PLGB 04425/0820. 2 x 200 mg pre-filled pen: PLGB 04425/0875; 2 x 300 mg pre-filled pen: PLGB 04425/0771.

Further information is available from: Medical Information, Sanofi, 410 Thames Valley Park Drive, Reading, Berkshire, RG6 1PT, UK.
uk-medicalinformation@sanofi.com.
Date of Preparation: September 2021.
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Adverse events should be reported. Reporting forms and information can be found at www.mhra.gov.uk/yellowcard or search for MHRA Yellow Card in the Google Play or Apple App Store.
Adverse events should also be reported to the Sanofi drug safety department on Tel: 0800 0902 314. Alternatively, send via email to UK-drugsafety@sanofi.com

References: 1. DUPIXENT Summary of Product Characteristics;
2. SMC advice SMC https://www.scottishmedicines.org.uk/medicines-advice/dupilumab-dupixent-full-smc2317/ Accessed Sep 2021.

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Sanofi Genzyme and Regeneron are committed to providing resources to advance research in areas of unmet medical need among patients with inflammatory and immunologic diseases.

DUPIXENT® (dupilumab)

SPEAKERS' BIOGRAPHICAL DETAILS

Dr Ayodeji Adegunsoye is an Assistant Professor of Medicine at the University of Chicago and a pulmonologist who specializes in interstitial lung diseases, genetics research, prognostic modelling and health care disparities. He is the Scientific Director of the University of Chicago Interstitial Lung Disease Programme, where he actively cares for patients with pulmonary fibrosis and various forms of interstitial lung diseases in the outpatient clinic and the ICU. He also leads efforts at the University of Chicago's post-COVID pulmonary clinic to minimise lung scarring and improve outcomes in all patients after hospital discharge.

Dr Ahsan Akram is a Cancer Research UK Clinician Scientist at the University of Edinburgh and Honorary Consultant in Respiratory Medicine in NHS Lothian. He completed a PhD in optical molecular imaging in 2015 and his clinical training in 2017. His research interests include understanding the mechanisms of immunotherapy failure in non-small cell lung cancer, with a focus on the tumour microenvironment as mediators of immune recognition evasion. He is also interested in developing and translating high resolution optical imaging techniques to patients to allow for better treatment stratification.

Professor Daniel Alexander is Director of the UCL Centre for Medical Image Computing (CMIC) at University College London (UCL) and Professor in the Department of Computer Science at UCL. His expertise is in computational modelling, machine learning, imaging and image analysis. He graduated with a degree in Mathematics from the University of Oxford (1993), and MSc in Computer Science from UCL (1994), and a PhD in Computer Science from UCL (1998). Professor Alexander worked as a post-doc at the University of Pennsylvania until 2000 when he returned to London to take up an academic position. He became full professor in 2010, Director of CMIC in 2015, and Senior Fellow of the ISMRM in 2017.

Professor Nim Arinaminpathy is Professor of Mathematical Epidemiology at Imperial College London. In his research, he applies mathematical modelling to study the spread and control of infectious diseases, with a focus on human tuberculosis (TB). He works closely with national TB programmes in high-burden countries, particularly India and Kenya. He also works with the WHO South-East Asian Regional Office (SEAR) on TB control priorities for the region. Professor Arinaminpathy serves on the SEAR Regional Advisory Committee on Multi-drug-Resistant TB, as well as on the WHO Strategic and Technical Advisory Group for TB. Additionally, since 2020 he has been working closely with the Indian Council of Medical Research, providing advice in support of the COVID-19 response in India.

Dr Kenneth Baillie graduated from the University of Edinburgh with a BSc (Hons) in Physiology in 1999 and MBChB in 2002. He completed basic training in medicine in Glasgow, and in anaesthesia in Edinburgh. During this time, he led a series of high-altitude research projects in Bolivia, and founded a high-altitude research charity, Apex. He was appointed as a Clinical Lecturer on the ECAT (Edinburgh Clinical Academic Track) at the University of Edinburgh in 2008, and completed a Wellcome Trust-funded PhD in statistical genetics in 2012. He was awarded a Wellcome-Beit Prize Intermediate Clinical Fellowship in 2013. He led a global consensus on harmonisation of research studies in outbreaks for the International Severe Acute Respiratory Infection Consortium (ISARIC), and worked with WHO on H1N1 influenza, MERS, and Ebola. After completing clinical training in 2014, Dr Baillie worked as a visiting scientist at the Broad Institute of Harvard and MIT, before returning to the Roslin Institute, University of Edinburgh to establish a research programme in translational applications of genomics in critical care medicine. He works as a consultant in the intensive care unit at the Royal Infirmary, Edinburgh. During the COVID outbreak in 2020-21, he led the UK-wide GenOMICC and ISARIC4C studies, and contributed to the design and delivery of the RECOVERY trial. He discovered new biological mechanisms underlying critical illness in COVID, and contributed to the discovery of effective drug treatments to reduce mortality.

Deborah Baines is Professor of Molecular Physiology at St George's, University of London. She teaches physiology and leads a research team predominantly focused on the functional measurement of ion and solute transport across airway epithelium. She has an interest in the pathogenesis of chronic obstructive pulmonary disease (COPD), cystic fibrosis and the effect of hyperglycaemia (associated with diabetes) on glucose homeostasis in the lungs. Given the debate around the safety of e-cigarettes versus tobacco products, she has recently conducted studies on the effect of electronic cigarettes on airway physiology. Professor Baines is a Trustee and Fellow of the Physiological Society.

SPEAKERS' BIOGRAPHICAL DETAILS

Chris Barber is a respiratory consultant with a clinical and research interest in occupational lung disease. His time is split between NHS clinical work in Sheffield and HSE sessions at the Centre for Workplace Health in Buxton. He is a member of the Group of Occupational Respiratory Disease Specialists (GORDS), and the current Chair of the BTS Occupational and Environmental Lung Disease Specialist Advisory Group.

Dr Hayley Barnes is a Respiratory Physician at the Alfred Hospital, Melbourne, Australia, and a research fellow at Monash University. Hayley's research interests include accurate diagnosis and improving outcomes for those with hypersensitivity pneumonitis and other ILDs.

Eihab Bedawi is a Senior Trainee in Respiratory Medicine and Clinical Research Fellow in Pleural Disease at the Oxford Pleural Unit. He is undertaking studies toward a higher degree with the title of 'Improving outcomes with alternative interventions in pleural infection'. He is the trial coordinator for MIST-3, a multicentre feasibility RCT of early VATS versus intrapleural enzyme therapy in pleural infection. He is currently the trainee representative on the BTS Pleural Specialist Advisory Group.

Kylie Belchamber is a Research Fellow within the Institute of Inflammation and Ageing at the University of Birmingham. She is also Secretary of the BALR. Kylie's research interests are the role of innate immune cells, specifically macrophages and neutrophils, in lung ageing and disease.

Professor Jon Bennett, recent ex-officio Chair of the BTS – a wonderful role working with fantastic people. Blessed to be working with great colleagues at Glenfield Hospital, Leicester. He is happy with most things respiratory medicine, except the NHS's inability to support the specialty to the degree it needs and sort out Winter Pressures. Jon is still trying to do his bit for the environment; pottering about on a bike very slowly.
Clinical interests include: lung cancer, interventional respiratory procedures, medical education, and general respiratory medicine.

Dr Jaishree Bhosle is a Consultant Medical Oncologist specialising in the treatment of thoracic cancers including lung cancer and mesothelioma. She qualified from the University of Leicester and undertook general medical training at University Hospital Birmingham NHS Trust. She undertook laboratory-based research at University College London and was awarded a PhD in 2012. Her research focused on the modulation of DNA damage and repair by epidermal growth factor receptor tyrosine kinase inhibitors.
Dr Bhosle completed her specialist training at The Royal Marsden and was appointed as a Consultant Medical Oncologist in 2011. In 2019 she took on the role of Director of Medical Education and has been involved in developing educational courses for oncology trainees. In addition to her role at The Royal Marsden Hospital, she provides acute oncology services at Epsom and St Helier University Hospitals NHS Trust.

Professor Charlotte Bolton is a clinical academic in respiratory medicine at the University of Nottingham. Her clinical focus is COPD and her research embraces chronic respiratory disease and multimorbidity, as well as exercise and rehabilitation interventions. In addition, she is interested in the long-term respiratory sequelae of being born preterm, global lung health and more recently has been conducting research into the persisting symptoms post COVID-19. She is Chair of the BTS COPD Specialist Advisory Group and a member of the BTS Global Health Group.

Professor Jeremy Brown is an academic respiratory consultant at University College London where he leads a team investigating the pathogenesis and mechanisms of immunity for the bacterial causes of pneumonia Streptococcus pneumoniae and Acinetobacter baumannii. In addition, he is involved in translational research into patients with bronchiectasis and COVID-19. His clinical practice concentrates on clinical respiratory infection, including bronchiectasis, aspergillosis, and pneumonia in immunocompetent and immunocompromised patients. Professor Brown is a member of the UK Joint Committee on Vaccination and Immunisation, contributing to national decisions on vaccine policy including the COVID-19 vaccination programme.

William W Busse, MD is an Emeritus Professor of Medicine in the Division of Allergy, Pulmonary and Critical Care Medicine at the University of Wisconsin School of Medicine and Public Health. His research has focused on mechanisms of asthma including eosinophilic inflammation, rhinovirus provoked asthma exacerbations and asthma-brain interactions in relationship to airway inflammation. In addition, Dr Busse was the Principal Investigator for the NIH-supported Inner-City Asthma Consortium, which was

established to determine mechanisms of asthma in these high-risk children and to develop and evaluate immune-based therapy to achieve disease control.
Dr Busse was a member of the US NAEPP Guidelines for the Diagnosis and Management of Asthma.

Dr John Cannon is a Respiratory Physician and Director of the Pulmonary Vascular Diseases Unit at Royal Papworth Hospital. This a designated pulmonary hypertension specialist centre and the only nationally designated centre for pulmonary endarterectomy surgery and balloon pulmonary angioplasty. His respiratory medicine training was in Cambridge and during this he undertook research leading to his PhD. He has published a number of articles, both scientific and clinical, in the area of pulmonary hypertension.

Professor James Chalmers is the British Lung Foundation Chair of Respiratory Research at the University of Dundee and a Consultant Respiratory Physician at Ninewells Hospital. His research and clinical interests are in difficult lung infections. He chairs the European Bronchiectasis Registry (EMBARC) and chaired the 2017 ERS Bronchiectasis Guidelines, the 2020 ERS COPD inhaled corticosteroid guidelines and currently chairs the ERS COVID19 task force. He is current Deputy Chief Editor of the ERJ.

Dr Nazia Chaudhuri is a respiratory physician and Clinical Lead for the Interstitial Lung Disease (ILD) Service at the Manchester University NHS Foundation Trust (MFT), UK. She is an Honorary Senior Lecturer at the University of Manchester. She is also Deputy Clinical Director of the Respiratory Directorate at MFT and the academic year 3 lead for the undergraduate medical school.
The MFT ILD tertiary service has established itself as one of the largest ILD units in the UK delivering exemplary care to over 900 new patients per year. Dr Chaudhuri is the clinical lead of a growing team consisting of seven consultant colleagues, two clinical fellows, three ILD Specialist nurses, two ILD pharmacists and a multi-disciplinary team (MDT) co-ordinator.
She graduated from the University of Leeds with an honours degree in medicine and a BSc honours in genetics. She performed a PhD and published her work looking at the cellular interactions and signalling in response to infection and air pollution.
As an ILD specialist, Dr Chaudhuri has developed the local ILD service by enhancing the delivery of care by establishing a day case model to reduce waiting times, creating a clinical database and ensuring a presence on the internet by developing a website, Twitter and Facebook page. She has been instrumental in setting up and delivering a regional North West and Northern ILD network.
Dr Chaudhuri is the principal investigator on a number of clinical research trials (>20 over 5 years) in idiopathic pulmonary fibrosis (IPF) and is the UK Chief Investigator of a major clinical trial on progressive ILDs and a trial in IPF. She is collaborator on a number of grants exceeding £5 million and has co-authored 41 peer reviewed articles in 5 years. She is also co-applicant for a British Lung Foundation grant for a study in Sarcoidosis.
Dr Chaudhuri has published her experience in prescribing antifibrotics and delivering MDT care and has presented over 30 abstracts pertaining to IPF, antifibrotics and the importance of a multi-disciplinary team approach at all major respiratory conferences.
She is Chair of the British Thoracic Society (BTS) Interstitial and Rare Lung Disease Specialist Advisory Group. She has been instrumental in ensuring that MFT is the biggest contributor to the BTS IPF Registry. She is also a medical adviser for the British Lung Foundation.

Dr Colin Church is a Consultant in Pulmonary Vascular and Respiratory Medicine. He trained in Glasgow, Cambridge, Papworth and Sydney. He has completed a PhD in understanding the basic mechanisms of inflammatory signaling in pulmonary vascular remodeling. He has a keen interest in both clinical and basic science research and is a principal investigator on a number of important clinical trials including looking at novel anti-inflammatory strategies to treat pulmonary hypertension. His basic science research focuses on the interplay of inflammation and hypoxia on the pulmonary vascular cells in particular the pulmonary artery fibroblast.
Dr Church is one of three consultants in the Scottish Pulmonary Vascular Unit which is the national referral centre for the Scottish population. This unit investigates and manages all patients in Scotland with pulmonary hypertension. He is also one of the principal clinicians involved in management of venous thromboembolic disease in the Queen Elizabeth University Hospital and sits on the Glasgow Thrombosis Committee. He is the educational workforce leader for the International Society of Heart and Lung Transplantation (ISHLT) and Associate Editor for BMC Pulmonary Medicine. More recently he has become the Chair of the BTS Pulmonary Vascular Specialist Advisory Group.
Twitter @acchurch1

Professor Alison Condliffe is Professor of Respiratory Medicine at the University of Sheffield. After graduating from Cambridge and London, she undertook a PhD in Edinburgh and a Wellcome Intermediate Fellowship at the Babraham Institute in Cambridge, with a subsequent lectureship in the Department of Medicine at the University of Cambridge. She moved to Sheffield in 2015.
Her research interests include host-pathogen interactions, neutrophil-mediate tissue injury, and the impact of hypoxia on innate immune cell function, with a particular focus on the PI3-kinase signalling pathway. Professor Condliffe is an Honorary Consultant in Respiratory Medicine and her clinical interests include respiratory infections, the respiratory complications of immune deficiency, and non-CF bronchiectasis. She serves on a number of peer-review and scientific committees, and is Deputy Chair of the MRC Infection and Immunity Board.

Dr David Connell is Chair of the British Thoracic Society Pulmonary Infection Specialist Advisory Group and is a Consultant Physician in Respiratory and General Internal Medicine at Ninewells Hospital, NHS Tayside. His main clinical interests incorporate complex lung infections, particularly tuberculosis, chronic pulmonary aspergillosis, and non-tuberculous mycobacteria. He has interests in the delivery of care in both chronic and acute respiratory infections; as part of this, he was the Lead for Winter Planning at NHS Tayside 2020-21, and was a co-opted member of the UK New and Emerging Respiratory Virus Threats Advisory Group (NERVTAG) during the first 12 months of the COVID-19 pandemic.
In 2019, Dr Connell was awarded a Chief Scientist's Office Scotland NRS Career Fellowship to study fungal lung infections, and in 2020 was awarded a CSO Scotland grant as Chief Investigator for the FOcused LongitudinaL Observational Study to Improve KnoWledge of COVID-19 (FOLLOW-COVID).

Dr Bronwen Connolly is a Critical Care Physiotherapist and Senior Lecturer in Critical Care at Queen's University Belfast, UK. She is the recipient of three previous NIHR Fellowships (Doctoral, Postdoctoral, Clinical Trials), and her research interests focus on acute respiratory and rehabilitation physiotherapy, the recovery, long-term outcome, and survivorship of post critical illness patients, and clinical trial methodology around complex rehabilitation interventions.
Bronwen currently leads a multi-professional team delivering an NIHR HTA-funded, multi-centre randomised controlled trial investigating the effectiveness of muco-active drugs in acute respiratory failure (the MARCH trial), and the development of a core outcome set for trials of physical rehabilitation in critical illness (PRACTICE).

Dr John Corcoran is a Consultant Chest Physician and RCP(L) College Tutor at Derriford Hospital, University Hospitals Plymouth NHS Trust, where he is Pleural Lead for the Trust and Service Line Director for the Respiratory Department. He completed his undergraduate training at Oxford in 2005 before going on to train in respiratory medicine in the Thames Valley region, including four years as a Clinical Research Fellow at the University of Oxford Respiratory Trials Unit where he undertook his DM thesis on novel clinical uses of thoracic ultrasound and coordinated a multinational, multicentre observational study of adult pleural infection (PILOT). He has been based at Derriford Hospital since 2017, maintaining his clinical and academic interests in pleural disease, lung cancer, and point-of-care thoracic ultrasound.

Associate Professor Tamera Corte is a Consultant Respiratory Physician and Director of Interstitial Lung Disease in the Department of Respiratory Medicine at Royal Prince Alfred Hospital, and an Associate Professor at the University of Sydney.
She is Chief Investigator on a recently awarded Centre of Excellence NHMRC grant for pulmonary fibrosis, which strives to improve and extend the lives of patients living with pulmonary fibrosis through the development of a comprehensive and integrated programme of basic and clinical research and education across Australia. She is the founding Chair of the Steering Committee for the Australian Idiopathic Pulmonary Fibrosis Registry, the Australasian Interstitial Lung Disease Registry and a member of multiple international task forces for interstitial lung disease guidelines.
A/Prof Corte trained in respiratory medicine at the University of New South Wales in Sydney, Australia. She served as Clinical Fellow in Interstitial Lung Disease at the Royal Brompton Hospital in London with Professor Athol Wells. Dr Corte earned a doctor of philosophy degree in the identification of pulmonary vascular dysfunction in interstitial lung disease. She continues her research at Sydney University, where her interests include interstitial lung diseases as well as pulmonary vascular disease.

Professor Richard Costello is a Professor of Respiratory Medicine at Beaumont Hospital, Dublin. His research is in understanding medication adherence

and how this may influence outcomes among patients with asthma and COPD. Aside of this research work and clinical work in asthma and COPD care, he also is the Education Chair at the ERS.

Professor Andrew Curran is the Chief Scientific Adviser (CSA) and Director of Research at the Health and Safety Executive (HSE). He has responsibility for ensuring that HSE has access to the evidence needed to underpin policy and regulatory decision making. He is Deputy Head of the Government Science and Engineering Profession under Sir Patrick Vallance, and as a Government Chief Scientific Adviser, he is part of the Government Chief Scientific Adviser's CSA network. During the SARS-CoV-2 pandemic he has been an active participant in SAGE, and is leading one of six large National COVID-19 Core Projects.

Gráinne d'Ancona is the Consultant Pharmacist for Respiratory Medicine at Guy's and St Thomas' NHS Foundation Trust and Senior Lecturer at King's College London. She has contributed to national guidelines and training programmes, and holds several national committee seats, most notably on the NHS England Respiratory Delivery Board, the RCP National Asthma and COPD Audit Programme Board, the BTS Pharmacist Specialist Advisory Group and the UKCPA Respiratory Committee.
An advocate for integrated respiratory care and value-based interventions, her clinical roles include optimising care for patients with severe asthma, COPD, ILD and sleep disorders, in the hospital setting and also through virtual clinics in general practice. Her particular area of academic interest is medicines adherence.

Dr Hayley Barnes is a Respiratory Physician at the Alfred Hospital, Melbourne, Australia, and a research fellow at Monash University. Hayley's research interests include accurate diagnosis and improving outcomes for those with hypersensitivity pneumonitis and other ILDs.

Marion Delcroix graduated from the Free University of Brussels, where she specialised in respiratory medicine. She is currently Professor of Medicine and of Respiratory Physiology at the Universities of Leuven and Kortrijk, Belgium. She is Head of the Pulmonary Hypertension (PH) Programme, in charge of the Respiratory High Care Unit, and Chair of the Council for Rare Diseases of the University Hospitals of Leuven. She has been involved in the routine care of over 2000 patients with PH and has participated in main pivotal trials for the treatment of pulmonary arterial hypertension (PAH).

Dr Delcroix was a task force member at the 3rd to 6th World Symposia on PH, a nucleus member of the Working Group on Pulmonary Circulation and RV Function of the European Society of Cardiology (ESC) and is a founding member and Chair-elect of the International CTEPH Association (ICA). She has over 200 publications, with research interests focusing on pulmonary circulation and gas exchange, cardiac imaging, and the role of inflammation in the pathogenesis of PAH and CTEPH. She has been Associate Editor of the European Respiratory Journal (ERJ) and is currently Deputy Editor of the Journal of Heart and Lung Transplantation (JHLT). Lastly, she was involved as core member for PH in the European Reference Network (ERN)-lung, as Assembly Head for Pulmonary Vascular Diseases of the European Respiratory Society (ERS), and as scientific board member of the World Symposia on Pulmonary Hypertension Association (WSPH). She is a fellow of the ESC and of the ERS.

Dr Maya Desai has been a Consultant in Respiratory Paediatrics at Birmingham Children's Hospital since 2003. Via posts in Newcastle, London and Melbourne, she moved to Birmingham to undertake CF research, completing her paediatric respiratory training in the West Midlands. As well as being CF Centre Director, she is involved in a busy clinical respiratory unit and is active in clinical research. Specific interests include new born screening, microbiology and transition to adult care. She has been a member of the BTS Cystic Fibrosis Specialist Advisory Group (2017-2021), the PHE CF Screening Advisory and is now a member of the UKCFMA Executive Committee.

Dr Nikesh Devani is a locum Consultant in Respiratory Medicine at the Royal Free London NHS Foundation Trust with a sub-speciality interest in sleep and ventilation. He is member of the BTS Tobacco Specialist Advisory Group and Co-lead for the National Smoking Cessation Audit.

Professor Kev Dhaliwal graduated from Edinburgh Medical School and trained in London and Edinburgh before relocating to Edinburgh to undertake a PhD and build a new grouping to develop interventional technologies to improve human health.
He is a Consultant Physician in Respiratory Medicine at the Royal Infirmary of Edinburgh and has a passion for developing new approaches for healthcare impact and is the Chief Investigator on multiple human trials to test and develop new therapies and devices for lung diseases. Collaborating widely with industry, he is an advocate of

the need to work across scientific disciplines and translate science research into healthcare.

Dr Niharika Duggal is a Lecturer in the Institute of Inflammation and Ageing at the University of Birmingham, with a research group focussed on exploring the role of immune senescence as a contributor to pathological conditions that affect older adults with a higher incidence and traumatic injury and other illnesses that can accelerate immune senescence. Furthermore, she is focussed on investigating the underlying mechanisms driving immune senescence and examining the role of microbiome-based interventions in reversing the immune ageing clock.

Dr Matthew Evison qualified from Manchester University Medical School in 2004. He undertook specialist training in Respiratory Medicine 2008-2014 including a two-year fellowship in Thoracic Oncology at Wythenshawe Hospital, Manchester University NHS Foundation Trust, completing an MD degree in lung cancer diagnostics. He was appointed as a Consultant in Respiratory Medicine (Thoracic Oncology) at Wythenshawe Hospital in 2014. Dr Evison is Clinical Director for Lung Cancer for Greater Manchester Cancer and Clinical Lead for the Greater Manchester CURE Project (hospital-based tobacco addiction treatment services). He is Chair of the British Thoracic Society Pleural Specialist Advisory Group (SAG), a member of the BTS Tobacco SAG and a member of the British Thoracic Oncology Group Steering Committee and the Lung Cancer Expert Group.

Professor Morag Farquhar is Professor of Palliative Care Research at the University of East Anglia (UEA). She has worked in health services research for over 30 years, predominantly in supportive and palliative care, within the universities of London, Manchester, Cambridge and UEA. An early graduate nurse by background (King's College London), with an MSc in Medical Sociology, her PhD (University of London) addressed the definition and measurement of quality of life in older people. Research interests include breathlessness in advanced disease, informal carers, and developing and testing of interventions using mixed methods.

Professor Matthew Fisher works on emerging pathogenic fungi and heads a research group in the MRC Centre for Global Infectious Disease Analysis in the Imperial College London School of Public Health. His research group is focused on developing genomic, epidemiological and experimental models to uncover the factors driving fungal infections, and to develop new methods of diagnosis and control. He leads a Wellcome Trust Collaborative Award investigating the emergence of antifungal resistance in the pulmonary pathogen Aspergillus fumigatus and has an interest in changing human exposure to bioaerosols that includes disease in patients with COVID-19. Professor Fisher is currently an ad-hoc member of the Defra Air Quality Expert Group

Monica Fletcher OBE is an Honorary Research Fellow at the Usher Institute, University of Edinburgh, Partnerships Lead at BREATHE HDRUK respiratory datahub, and Advocacy Lead for Asthma UK Centre for Applied Research.
Monica is involved in several respiratory focussed grants at the University of Edinburgh. She was previously employed by GSK as a Global Medical Expert (Respiratory). She has been involved in national and international policy through activities with WHO Global Alliance Against Respiratory Disease (GARD), ERS, ATS, European COPD Coalition, and IPCRG. She was Chair of the European Lung Foundation (2010-14) advocating for wider patient engagement in research. Her clinical interests are asthma, COPD and how data and technology can improve HC systems and patient outcomes.
Monica is honoured with an OBE for services to nursing and is a Fellow of the Queen's Nursing Institute (QNI). She has also been acknowledged as a Fellow of the European Respiratory Society

Professor Andres Floto is a Wellcome Trust Investigator and Professor of Respiratory Biology in the Molecular Immunity Unit of the University of Cambridge (based at the MRC Laboratory of Molecular Biology), Co-Director of the Cambridge Centre for AI in Medicine (CCAIM), Research Director of the Cambridge Centre for Lung Infection at Royal Papworth Hospital, and Director of the UK Cystic Fibrosis (CF) Innovation Hub.
His basic research is focused on understanding how macrophages interact with bacteria, how bacteria evolve during chronic infection and transmission, and how forward and reverse genetics can be combined with fragment-based drug discovery to develop novel antibiotics and host-directed therapies.
Professor Floto's clinical research is centred around treating non-tuberculous mycobacteria (NTM), tackling chronic inflammation in CF and non-CF bronchiectasis, using graph-based machine learning to understand and predict pulmonary exacerbations, and applying deep learning methods to provide individualised clinical

forecasting for patients with CF.
Clinically, he specialises in the management of non-tuberculous mycobacteria, cystic fibrosis, non-CF bronchiectasis and recurrent chest infections.

Dr Gary Fuller is an Air Pollution Scientist at Imperial College London and a UKRI Clean Air Champion. His research interests focus on urban air pollution sources, how these are changing in response to policies, and how they affect our health. Gary is a regular contributor to the Guardian newspaper. He has a keen interest in air pollution history and how the lessons from the past can help future air pollution management. He explored these themes in his book "The Invisible Killer – the rising global threat of air pollution and how we can fight back".

Professor Julie Gibbs is a Versus Arthritis Senior Research Fellow in the Centre for Biological Timing at the University of Manchester. Her laboratory undertakes research investigating circadian control of immunity. Her studies have contributed to the field's understanding of the importance of cell intrinsic clockwork machinery in regulating inflammation. Her early work identified bronchial epithelial cells as key timing cells in the lung, important for regulating the timing and amplitude of inflammatory responses, as well as responses to therapeutic agents.

Dr Maciej L Goniewicz is a Professor of Oncology at the Department of Health Behaviour, Roswell Park Comprehensive Cancer Centre in Buffalo, NY. He earned a PharmD degree and a PhD in Toxicology and Pharmacology. Dr Goniewicz's primary research area is in toxicity of tobacco products and nicotine pharmacology. His current research is focused on new nicotine-containing products and alternative forms of tobacco. He examines safety electronic cigarettes and emerging heated tobacco products. These studies include the laboratory evaluation of the products, pharmacological and toxicological assessment, surveys among their users, and their potential application in harm reduction and smoking cessation.

David Gordon is Professor of Social Justice and the Director of the Bristol Poverty Institute and the Townsend Centre for International Poverty Research at the University of Bristol. He is a member of the International Network for Research on Inequalities in Child Health (INRICH) and in 2018 he had the honour of being elected as a Fellow of the British Academy for his work on poverty research.
He has written and edited over two hundred books, papers and reports on poverty, health inequalities and social exclusion, social justice and social policy. Professor Gordon was a member of the UN Expert Group on Poverty Statistics (Rio Group) and contributed to its 'Compendium of Best Practice in Poverty Measurement'. He was a member of the EU Task Force on Material Deprivation and has advised the United Nations Department for Economic and Social Affairs (UNDESA) on poverty and hunger issues and worked with UNICEF on its first ever Global Study on Child Poverty and Disparities. From 2008 to 2011, he held a public appointment to the Child Poverty Expert Group of the Welsh Assembly Government. He led the Poverty and Social Exclusion in the United Kingdom (www.poverty.ac.uk) project, the largest project of its kind in UK history.
In 2006 and 2007, he was given the tremendous honour of addressing the General Assembly of the United Nations about child and youth poverty

Laura Graham is a Respiratory Physiotherapist and Respiratory Lead for the ACERS team in City and Hackney. Laura has worked in pulmonary rehabilitation and respiratory for over 10 years, completing her MSc in Cardiorespiratory Physiotherapy at University College London in 2016 and becoming a non medical prescriber in 2018. Currently Laura is also doing a part-time secondment as a Clinical Workforce Transformation Fellow for Health Education England, reviewing Long COVID rehabilitation across North East London. Laura's main interest is in cardiopulmonary rehabilitation, which is supported via a number of network roles such as Co-Lead of the London Pulmonary Rehabilitation Network, member of the British Thoracic Society Pulmonary Rehabilitation Specialist Advisory Group, as well as Co-Chair of the London Allied Health Professionals Long COVID Network.

Jonathan Grigg is Professor of Paediatric Respiratory and Environmental Medicine at Queen Mary University of London, an Honorary Consultant Respiratory Paediatrician at the Royal London Hospital (UK), and a NIHR Senior Investigator. His current research focusses on the effects of air pollution on airway infection, the fate of inhaled particulate matter in vivo, and asthma control in children in Sub Saharan Africa. He has also performed randomised controlled trials of treatments for asthma, and is currently chief investigator of an asthma prevention trial. He is a member of the UK Department of Health's Committee on the Medical Effects of Air Pollution, and Chair of the

European Respiratory Society's Tobacco Control Committee. He is a co-author of reports from the Royal College of Paediatrics and Child Health (UK) on the health effects of indoor and outdoor air pollution.

Dr Alanna Hare is a Consultant in Sleep and Respiratory Failure at the Royal Brompton Hospital in London. She graduated from Selwyn College, University of Cambridge in 1999, and completed her postgraduate training at Imperial College London in 2002. She is Chair of the British Thoracic Society Education and Training Committee and Treasurer of the British Sleep Society. She sits on the Board of the Sleep Council. She was made Honorary Clinical Senior Lecturer at NHLI in 2018.

Dr Janice Harper is a Consultant in Vasculitis and Renal Medicine at the Liverpool University Hospitals NHS Foundation Trust. Following a PhD in vasculitis immunology from Cambridge University, she became a nephrology consultant in Liverpool in 2000. She works in a multidisciplinary vasculitis service in close collaboration with respiratory colleagues in the North-West Severe Asthma Service. Dr Harper's research interest is in the area of new immunosuppressive agents for ANCA associated vasculitis.

Professor Nicholas Hart is currently Clinical Director for Sleep, Respiratory and Critical Care and Director of Research Delivery at Guy's and St Thomas' Hospital. He is clinical co-chair of the UK R&D Leaders Group. From 2012 to 2020, he was Head of the Lane Fox Respiratory Service, which is an internationally recognised weaning, rehabilitation and home mechanical ventilation service, which currently houses the largest weaning and rehabilitation unit in the UK and supports over 2500 patients with chronic respiratory disease and chronic respiratory failure. He was appointed in 2015 as Joint Editor-in-Chief of Thorax. Professor Hart established the Lane Fox Clinical Respiratory Physiology Research Centre in 2007 and he has developed a programme of research focused on admission prevention in COPD, muscle wasting prevention during critical illness and enhancing outcome in chronic respiratory failure and sleep disordered breathing. He was appointed as King's College London Professor of Respiratory and Critical Care Medicine in 2016.

Jamie Hartmann-Boyce is a senior researcher, departmental lecturer, and Director of the Evidence-Based Healthcare DPhil Programme with the Centre for Evidence-Based Medicine, Nuffield Department of Primary Care Health Sciences, University of Oxford. She is an editor and author for the Cochrane Tobacco Addiction Group and leads the Cochrane review of electronic cigarettes for smoking cessation.

Charles Haworth is a Respiratory Consultant working within the Cambridge Centre for Lung Infection at Royal Papworth Hospital where he specialises in treating adults with cystic fibrosis, bronchiectasis and non-tuberculous mycobacterial (NTM) infections. He was senior author of the International CF NTM Guidelines published in Thorax in 2015 and first author of the British Thoracic Society NTM Guidelines published in 2017.

Karen Heslop-Marshall is a Nurse Consultant working in Newcastle upon Tyne. Karen's main area of expertise is the psychological impact of respiratory disease. She completed a postgraduate diploma in cognitive behavioural therapy (CBT) in 2003 and developed a CBT treatment for patients with respiratory problems who face psychological difficulties. Karen completed a National Institute of Health Research (NIHR) PhD Clinical Academic Training Research Fellowship from 2011 to 2016. Her PhD research was the largest RCT into CBT for COPD patients who experience anxiety and depression. Karen was a co-applicant of the NIHR TANDEM HTA Study using CBT and pulmonary rehabilitation.

Pieter Hiemstra is Professor of Respiratory Cell Biology and Immunology at the Department of Pulmonology of the Leiden University Medical Center (LUMC) in The Netherlands, and Head of the PulmoScience Laboratory of the Department. He was trained as a medical biologist at Utrecht University and obtained his PhD in Leiden. His research is focused on basic and translational research in chronic obstructive pulmonary disease (COPD) and asthma, with an increasing research interest in fibrotic lung disease and lung cancer. He has a specific interest in the role of the epithelium of the airways and alveoli in these diseases, with a current focus on host-microbe interactions, repair and culture models. Antimicrobial peptides (AMPs) have formed a recurring theme in his research, and in 2015 he chaired the Gordon Research Conference on Antimicrobial Peptides. His other activities include teaching and curriculum development for Biomedical Sciences and Medical students. Professor Hiemstra has organised a range of symposia and conferences, and contributed to various national and international organisations, including the European

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Respiratory Society. In 2015, he chaired the Annual Congress of the European Respiratory Society in Amsterdam. He is currently Section Editor Basic Science of the European Respiratory Journal.

Jennifer R Honda PhD is an Assistant Professor at National Jewish Health, Colorado USA for the Centre for Genes, Environment, and Health, Department of Immunology and Genomic Research, and the NTM Centre for Excellence. Born and raised in Hawai'i, Dr Honda's growing research programme investigates the interrelated environmental, host, and NTM factors responsible for the emergence of NTM pulmonary disease in geographic hot spots, such as Hawai'i, in order to better forecast the fundamental drivers of disease emergence globally. Active in the American Thoracic Society (ATS) Pulmonary Infections and Tuberculosis (PI-TB) Assembly since 2014, she is the recipient of an ATS Foundation Award in Pulmonary Medicine, PI-TB's Rising Star, and PI-TB top Junior Faculty. The European Respiratory Society distinguished Dr Honda as an Innovator in NTM Science and Medicine.

Professor Nicholas Hopkinson is based at The National Heart and Lung Institute of Imperial College on the Royal Brompton Hospital Campus. His research focuses on addressing exercise and activity limitation in COPD in areas including pulmonary physiology and lung volume reduction, skeletal muscle impairment and pulmonary rehabilitation. His research has been funded by the MRC, The NIHR, The Wellcome Trust, The British Lung Foundation and The Moulton Foundation. He is also active in tobacco control advocacy and is Chair of Action on Smoking and Health as well as Medical Director of the British Lung Foundation. Follow @COPDdoc

Dr Matthew Hort is the Head of the Atmospheric Dispersion and Air Quality Research Group at the Met Office and also leads the Met Office SPF Clean Air Programme. Matt and team are responsible for developing and applying models suitable for modelling outdoor air quality and also contaminants from hazardous events such as industrial accidents, volcanic eruptions and biological sources. During his career Matt has focused on collaboration in the application of atmospheric science to health and environmental hazards including several national and international disasters.

Dr Jennifer Hoyle is a Respiratory Consultant based in Manchester Foundation NHS Trust. From July 2018 she joined the Respiratory Strategic Clinical Network in Greater Manchester as the Clinical Lead developing pilots for wider influenza vaccination, developing systems to reduce unwarranted variation in respiratory medicine provision and chairing assurance groups for COVID follow-up standards across Greater Manchester.
Dr Hoyle has a specialist interest in work and its effects on lung disease; she is a Senior Honorary Lecturer in Occupational and Environmental Lung Disease at Manchester University and is a member of the Surveillance of Work-related Occupational Respiratory Disease Committee (SWORD) at Manchester University.
In addition, Dr Hoyle is a member of the Industrial Injuries Advisory Council, the British Thoracic Society Specialist Advisory Group, the Group of Occupational Respiratory Disease Specialists UK and European Respiratory Society Occupational Group. She has lectured both nationally and internationally about respiratory conditions and has multiple publications in the field.

Alison Hughes qualified as an RGN in 1992 and has had a variety of roles in this time but predominately has worked within primary care since 1997. Alison has a unique job role which, prior to the COVID pandemic, involved educating primary care staff, within her local CCG, and a long-term condition's hub looking at diagnosis and management of complex patients. Since the pandemic, she has been redeployed to set up and run a mass vaccination centre as their Matron.
Alison has been the Chair of the Association of Respiratory Nurse Specialists (ARNS) since January 2021.

John Hurst is Professor of Respiratory Medicine at University College London where he has worked since 2007. He has a particular interest in mechanisms and mitigation of exacerbation susceptibility in COPD. His clinical work, based from Royal Free London NHS Foundation Trust, focuses on community and specialist COPD services. He is Senior Clinical Lead at the UK Royal College of Physicians National Asthma and COPD Audit Programme. He is Chief Editor of the European Respiratory Monograph and currently sits on the Editorial Board of the American Journal of Respiratory and Critical Care Medicine.

Joseph Jacob works at the Centre for Medical Image Computing, University College London, London, UK. He qualified in medicine from Imperial College before completing a MD(Res) at the National Heart and Lung

Institute where he was awarded the prize for the best thesis of 2017. In 2018, Dr Jacob was awarded a 5-year Wellcome Trust Clinical Research Career Development Fellowship. His current research, based at the Centre for Medical Image Computing at University College London, studies the use of computer-analysis of CT imaging in various lung diseases. Dr Jacob has co-authored over 80 papers, won national and international awards for his work, and is the 2021 Royal College of Radiologists Roentgen Professor.

Colin Jacobs is Assistant Professor within the Department of Medical Imaging of the Radboud University Medical Centre, Nijmegen, The Netherlands. Within the Diagnostic Image Analysis Group, he leads the research line on lung cancer image analysis. His PhD research focused on the automatic detection and characterization of pulmonary nodules in thoracic CT scans. Dr Jacobs is co-organiser of the biannual Thoracic Image Analysis Workshop at MICCAI, and is part of the Chest Scientific Programme Committee of RSNA.

Mariam Jamal-Hanjani is a Senior Clinical Lecturer and Honorary Consultant in Lung Oncology at the CRUK Lung Cancer Centre of Excellence, UCL Cancer Institute. In 2012 she was awarded a CRUK Clinical Research Fellowship for her PhD in chromosomal instability and intratumour heterogeneity and in 2016 she was awarded an NIHR Clinical Lectureship for her research in lung translational oncology during which she established the UK-wide PEACE research autopsy programme. In 2021 she was awarded a CRUK CEA to study the biological processes driving metastatic disease and death in lung cancer. Dr Jamal-Hanjani is PI of the TRACERx lung study at UCL and Chief Scientific Investigator of the CHIRON study investigating the clinical activity of autologous clonal neoantigen T cells in advanced non-small cell lung cancer.

Dr Shami Jayasooriya is an academic general practitioner interested in Global Lung Health. She was awarded an MRC PhD Scholarship (University of Birmingham, 2007-2011) based at the MRC Unit The Gambia at LSHTM and subsequently worked on TB sequel, a multi-site study exploring post-TB lung disease. She has an NIHR lectureship (University of Sheffield) with a research interest in non-communicable chronic lung disease in low- and middle-income countries. She holds advocacy roles at both a national (British Thoracic Society Global Health Group) and international level (The Union, Adult and Child Lung Health Working Group) related to non-communicable chronic lung disease.

Professor Gisli Jenkins is a Respiratory Physician and Cell and Molecular Biologist studying how the lung responds to injury to understand what drives progressive pulmonary fibrosis rather than healing, repair and regeneration. He is an NIHR Research Professor, leads the Margaret Turner Warwick Centre for Fibrosing Lung Diseases at the National Heart and Lung Institute and is an Honorary Consultant Physician at the Royal Brompton Hospital, London.

Alison John earned her undergraduate degree in Physiology and Pharmacology at the University of Sheffield and her PhD in the Department of Paediatrics at Sheffield Children's Hospital. She completed Research Fellowships at the University of Michigan and at the Sir William Dunn School of Pathology, University of Oxford where she was awarded the Chemocentryx Fellowship in Chemokine Biology and appointed Lecturer of Pathology at Worcester College before conducting post-doctoral research at the University of Nottingham. Her most recent research focused on preclinical evaluation of novel inhaled $\alpha v\beta 6$ inhibitors for use in the treatment of lung fibrosis and included developing SPECT-CT imaging modalities as non-invasive methods for assessing alveolar $\alpha v\beta 6$ integrin expression. In 2021, she joined the National Heart and Lung Institute at Imperial College as an Advanced Research Fellow within the new Margaret Turner Warwick Centre for Fibrosing Lung Disease.

Sebastian L Johnston is Professor of Respiratory Medicine and Allergy at the National Heart and Lung Institute, Imperial College London.
He is Director of the MRC and Asthma UK Centre in Allergic Mechanisms of Asthma, is the Asthma UK Clinical Professor and is a UK National Institute of Health Research Senior Investigator.
He edited Thorax from 2002-2010 and serves as Associate Editor on the editorial boards of several other respiratory and allergy journals. He has published >400 scholarly manuscripts and 18 patents. Notable achievements include establishing the viral aetiology of the majority of asthma and COPD exacerbations, discovering novel mechanisms of susceptibility to virus infection in asthma and COPD, and developing novel treatment approaches for acute exacerbations of these diseases.

Dr Mark Jones is an Associate Professor of Respiratory Medicine at the University of Southampton and Honorary Consultant in Respiratory Medicine at University Hospitals Southampton. He completed his PhD as a Wellcome Trust Clinical

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Training Fellow with Professor Donna Davies and Professor Luca Richeldi, where he investigated the pathogenetic role of collagen in lung fibrosis. He combines his clinical work, where he leads the interstitial lung disease service, with research applying human relevant in vitro models to dissect mechanisms underlying progressive lung fibrosis. He has translational research interests in novel imaging techniques, biomarkers and therapeutics in lung fibrosis.

Dr Myrsini Kaforou is a Senior Research Fellow in Bioinformatics and Sir Henry Wellcome Fellow at Imperial College London, in the Department of Infectious Disease, School of Medicine.
Her research focuses on the identification of host biomarkers for infectious diseases from genomic, transcriptomic and proteomic datasets using machine learning techniques and statistical modelling. She is particularly interested in the integration of multiple "-omics" datasets to improve diagnosis and understanding of the host response to infection.
In 2017, Dr Kaforou received a Sir Henry Wellcome Postdoctoral Fellowship to work on understanding and diagnosing infectious diseases using multi-level 'omics data, and in 2019 the Emerging Leaders Prize in Antimicrobial Resistance from the Medical Research Foundation to work on improving diagnosis of infectious diseases using patients' blood RNA to reduce antibiotic misuse.
Her PhD was awarded from Imperial College in 2015 on the identification of host gene expression biomarkers for tuberculosis disease.
She is leading the bioinformatics, data management and modelling work packages within the international DIAMONDS, PERFORM and NIH-TB consortia, which aim to improve diagnosis and management of febrile patients, through the application of sophisticated transcriptomic and bioinformatics approaches to large-scale patient cohorts.

Professor Frank J Kelly holds the Humphrey Battcock Chair in Community Heath Policy at Imperial College London, where he is Director of the Environmental Research Group, Director of the NIHR Health Protection Research Unit on Environment and Health and Deputy Director of the MRC-PHE Centre for Environment and Health. Professor Kelly leads a substantial research activity which spans all aspects of air pollution research from toxicology to science policy. He has led studies of the urban airshed within London including the impact of the introduction of London's Congestion Charging Zone, Low Emission Zone and the ultra-Low Emission Zone. He is past Chairman of the British Association for Lung Research and he has provided policy support to the WHO on air pollution issues. He chaired COMEAP, the UK's Department of Health and Social Care Expert Committee on the Medical Effects of Air Pollutants for the last 9 years and he is a member of the US Health Effects Institute Review Committee.

Priti Kenia is a Paediatric Respiratory Consultant at Birmingham Women's and Children's Hospital, one of the UK's premier paediatric hospitals. She completed her Paediatric Respiratory Grid training and MD Research degree (in respiratory ciliary function) from Leicester in 2011. She leads the bronchiectasis, PCD and ciliopathy service and co-leads the sleep service. Dr Kenia played a pivotal role in development of telemedicine services at BWCH. Her special interests are bronchiectasis, PCD, chronic cough and rare diseases. She is PI for research studies including Nintedanib-trial and previously ChILD-EU. She actively engages in research and has published in peer reviewed journals.

David Kiely is a Consultant Respiratory Physician, Sheffield Pulmonary Vascular Disease Unit, Royal Hallamshire Hospital, Sheffield Teaching Hospitals NHS FT and a Professor of Pulmonary Vascular Medicine at the University of Sheffield, UK. His clinical interests include pulmonary hypertension, pulmonary embolic disease and the respiratory complications of multi-system diseases. He is the Chair of the UK National Audit of Pulmonary Hypertension, a PVRI Imaging Task Force leader and a board member of the International World Pulmonary Functional Imaging Group. He participates in research funded by the NIHR, BHF, Wellcome and the MRC.

Dr Samantha Kon is a Consultant Chest Physician and Clinical Lead of the Hillingdon Integrated Respiratory Service. She is based at both Hillingdon and Harefield Hospitals, and cares for patients with airways disease, respiratory failure and sleep disorders. Her research interests are using functional outcome measures and health-related quality of life instruments in COPD and pulmonary rehabilitation. Dr Kon is also the Co-chair of the London Respiratory Clinical Network Pulmonary Rehabilitation workstream and is the Pulmonary Rehabilitation Lead for North West London.

Dr Heinke Kunst is a Senior Lecturer at Queen Mary University and Honorary Consultant at Barts Health. Her main research interests include migrant

health, translational research themes in tuberculosis, latent tuberculosis infection, non-tuberculous mycobacterial (NTM) disease and COVID-19 infection. Dr Kunst leads with colleagues a multidisciplinary NTM service at Barts Health managing 30-40 patients on NTM treatment annually.

Professor Monica Lakhanpaul is an academic researcher, broadcaster and practising paediatric consultant. She is currently a Professor of Integrated Community Child Health at UCL Great Ormond Street Institute of Child Health, UCL Pro-Vice-Provost for South Asia and member of Faculty of Public Health by distinction. She is committed to improving the lives of those in the most vulnerable communities through holistic, cross-sectoral interdisciplinary action-orientated interventions that encompass health, environmental and educational factors. She is a recipient of the Asian Women of Achievement Award, British Science Association media fellowship and is advisor to UK and international government authorities. Her research tackles some of the most pressing issues facing marginalised, minority and vulnerable families globally such as early years, nutrition, development and mental health. Professor Lakhanpaul uses participatory research, citizen science, and arts-based approaches (film, theatre, drawings and poetry) ensuring that communities have a voice and are involved in co-developing holistic integrated solutions. She is a science communicator and has over 180 publications to her name as well as being a regular guest on BBC Radio Science. She writes her own poems as a way to engage the public in important societal issues.

Dr Richard Lee is a Consultant Respiratory Physician and Champion for Early Cancer Diagnosis at the Royal Marsden-ICR Biomedical Research Centre. His clinical interests include early cancer diagnosis, and respiratory medicine in cancer patients. He is joint National Clinical Lead of the NHS England National Targeted Lung Health Check Programme that will pilot lung cancer screening in over 1 million participants across the UK. He is also co-lead for The Royal Marsden-ICR Early Diagnosis and Detection Centre.
His research portfolio includes translation of artificial intelligence and biomarker research to early cancer detection within the LIBRA, NIMBLE, OCTAPUS-AI and DART Biomarker studies. Dr Lee serves on the BTS Lung Cancer Specialist Advisory Group and ERS College of Experts.
Twitter @ChestConsultant

Marc Lipman is Professor of Medicine at University College London and Consultant in Respiratory and HIV Medicine at the Royal Free London NHS Foundation Trust. He is Lead for Mycobacterial Services at the Royal Free and Director of UCL-TB, UCL's cross-disciplinary TB research grouping. He Chairs the BTS TB Specialist Advisory Group, and NTM Network UK, the national clinical research group on NTM. He sits on the BTS MDR-TB Clinical Advice Service Steering Group; and was part of the NICE TB Clinical Guidelines and the BHIVA TB/HIV Management Guidelines groups. His research focusses on mycobacterial disease, respiratory infection and HIV.

Zaheer Mangera is a Respiratory Consultant at North Middlesex Hospital and Chair of the BTS Tobacco Specialist Advisory Group. He is Lung Cancer Lead at North Middlesex Hospital with an interest in tobacco, including previously leading on the BTS National Smoking Cessation Audit.

Vanessa McDonald is a Professor of Nursing in the School of Nursing and Midwifery at the University of Newcastle, Australia. She is Co-Director of the Centres of Excellence in Severe Asthma and in Treatable Traits. Vanessa is also Head of Research in the School of Nursing and Midwifery and holds an honorary professorial appointment with the University of Manchester. Vanessa's research interests are centred around the development of innovative approaches to the management of chronic airway diseases. She is passionate about the development and implementation of personalised medicine strategies that place the person at the centre of health care delivery.

Laura McNaughton is currently working as a Pleural Clinical Nurse Specialist in the Pleural Disease Unit within the Queen Elizabeth University Hospital. She specialises in managing patients with pleural disease and has a specialist interest in pleural medicine, asbestos related conditions and mesothelioma. She has recently completed a MSc in advanced nursing practice with a focus on pleural and palliative disease. As a CNS, she is involved in pleural research and supporting the pleural service. Laura currently sits on the BTS Pleural Specialist Advisory Group as the nurse representative.

Dr Jamilah Meghji is a Consultant Respiratory Physician at Imperial College NHS Healthcare Trust, and holds an MRC post-doctoral fellowship at the Liverpool School of Tropical Medicine, UK. She has a strong interest in global respiratory health. Her research work is focused on describing the nature and

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impact of post-tuberculosis lung diseases in low-resource settings, and developing strategies to improve the wellbeing of TB survivors.

Kerstin Meyer is a Principal Staff Scientist in Cellular Genetics, working with the Teichmann group and leading Human Cell Atlas projects within the Wellcome Sanger Institute, UK. Kerstin is using her expertise in molecular biology and transcriptional regulation of gene expression to contribute to the Human Cell Atlas, focussing on lung and airways over the life time (foetal, paediatric and adult) and in SARS-Cov-2 infection (paediatric, adult).
Kerstin is part of a number of international consortia trying to generate a first draft of the Human Lung Cell Atlas such as the HCA lung biological network, DiscovAIR (EU Horizon 2020) and MRC and Wellcome-funded foetal development grants.

Professor Gary Middleton is a Medical Oncologist who specialises in lung cancer and colorectal cancer. He has many years of experience in patient treatment, and also in development of novel clinical trials. Appointed to a Chair of Medical Oncology at Birmingham in 2013, he has built up a strong clinical and translational research programme. Gary also serves as a Clinical Director for the CRUK Birmingham Centre, Director of the Birmingham ECMC and is Lead for the Birmingham CRUK Clinical Academic Training Programme.
A key interest is in stratified approaches to patient treatment, and Gary has a strong presence in UK stratified medicine clinical trials. He is Chief Investigator for the National Lung Matrix Trial, a multi-centre, multi-arm, molecularly stratified clinical trial programme for UK patients with lung cancer. Outcome data was published in Nature in 2020. He is also interested in stratification approaches for immunotherapy and leads on the ANICCA trial, a phase II study in high class II expressing microsatellite stable colorectal cancer, a study directly translating the clinic work from his laboratory programme exploring the determinants and dynamics of class II expression in cancer. Another research focus is in understanding the tumour microenvironment and how this impacts on new therapeutic approaches, including novel immunotherapy strategies. One particular area of active study is myeloid derived suppressor cells (MDSC), which are thought to suppress tumour-specific immune responses. The discovery of novel predictors of checkpoint blockade toxicity is a key area of current research.

Dr Philip Molyneaux qualified from Guy's, King's and St Thomas' School of Medicine in 2004, completing an intercalated BSc in Molecular Genetics. He attained an NIHR Academic Clinical Fellowship in Respiratory Medicine at Imperial College studying the respiratory microbiome. Having completed his clinical training in Respiratory and Critical Care Medicine, he has taken up a Senior Clinical Lecturer and Consultant position in Interstitial Lung Disease at Imperial College and the Royal Brompton Hospital, where he is the Director of the Respiratory Clinical Research Facility.

Kevin Mortimer is a Professor of Respiratory Medicine at the Liverpool School of Tropical Medicine (LSTM), an Honorary Consultant at Liverpool University Hospitals NHS Foundation Trust and Director of Lung Health for the International Union Against Tuberculosis and Lung Disease (The Union). He is also Director of the NIHR Global Health Research Unit on Lung Health and Tuberculosis in Africa at LSTM, Deputy Director of the Pan African Thoracic Society Methods in Epidemiologic, Clinical and Operations Research (MECOR) Programme, and Chair of the British Thoracic Society Global Health Group. He is interested in developing solutions to the lung health needs of the world's poor including tackling global inequalities in access to basic effective care for chronic lung diseases.

Rachael Moses is a Consultant Respiratory Physiotherapist by background with areas of expertise including complex ventilation, airway clearance techniques and advanced care planning for patients with long term conditions. Rachael is currently Head of Clinical Leadership Development at NHSE/I and is National Clinical Advisor for Respiratory with the Personalised Care Team at NHSE/I. She is passionate about raising awareness regarding equity, diversity and inclusion.
Rachael is very proud to be the first non-medic BTS President taking her tenure in November 2021 and hopes this encourages others to apply for such roles. She is also fortunate to sit on a number of national organisations, including the Chartered Society of Physiotherapy Council and Honorary Student President, Co-Chairs the National HMV-UK Committee, is a Placement Co-ordinator for Medical Aid for Palestinians, Multimedia Editor for Thorax BMJ and member of the CSP LGBTQIA+ Network.

Stellah Mpagama has been working at Kibong'oto Infectious Diseases, a national referral hospital for tuberculosis in Tanzania, for more than a decade. Her

main research interest is in the development of solutions for infectious diseases, in particular tuberculosis. Currently, Stellah is one of the EDCTP_2 Senior Research Fellows supported to create a rapid response infrastructure including a clinical trial unit, and a group of research scientists (research trialists and laboratory scientists) that will be capable of addressing infectious diseases threats. Her professional goal is to build research capacity through meticulous design of clinical trials and implementation researchers, linking this with mentorship programmes.

Dr Stephen Mulupi is a health systems PhD student at the Liverpool School of Tropical Medicine, and is affiliated to Kenya Medical Research Institute, (KEMRI-Centre for Respiratory Diseases Research). Stephen has 12 years' professional research experience, and has led studies on health financing, reproductive health and sexuality, and human research ethics and communication. He holds an MSc Public Health (London School of Hygiene and Tropical Medicine), and a Master of Research - Global Health (Lancaster University). His PhD study investigates the response of the Kenyan public health system to people with symptoms of chronic non-communicable lung diseases, within devolved government context. His key research interests include universal health coverage, non-communicable diseases, health policy and implementation research.

Professor Anna Murphy is a Consultant Respiratory Pharmacist at University Hospitals of Leicester NHS Trust. She has over 25 years' experience working in the field of allergy and respiratory medicine. Working across Leicestershire, the post includes integrated care and the development of services for respiratory and allergy patients.
She is currently a member of the UKCPA Committee, pharmacist representative on the Internal Medicine NHSE CRG, Chair of the BTS Specialist Advisory Group for Pharmacists, and Co-chair of the Medicine Optimisation Committee of the Lung Taskforce. She also works with a number of charities; Anaphylaxis Campaign and Asthma UK Council of Healthcare Professionals.

Dr Lisa Nicol is a Consultant Respiratory Physician at the Royal Infirmary of Edinburgh. She is part of the Interstitial Lung Disease (ILD) team and has a particular interest in idiopathic pulmonary fibrosis (IPF). She completed an MD investigating the diagnostic and prognostic value of novel phenotyping methods and molecular markers in IPF when working within the University of Edinburgh/MRC Centre for Inflammation Research in 2016. She sat on the British Thoracic Society (BTS) Lung Registry Steering Group Committee for the IPF and Sarcoid Registries between 2017 and 2020.
Dr Nicol has presented her work at all of the major international conferences and is Principal Investigator on a number of clinical research trials in IPF. She is the ILD Lead for the Lothian Managed Clinical Network (MCN) and regularly provides educational sessions for all members of the multidisciplinary team across the Lothians to raise awareness and quality of care in ILD.

George T O'Connor is Professor of Medicine in the Division of Pulmonary, Allergy, Sleep and Critical Care Medicine at Boston University School of Medicine and an attending physician at Boston Medical Center. He has been the Boston University PI of many NIH-sponsored multi-center studies including the Inner-City Asthma Consortium, the Sleep Heart Health Study, the Feasibility of Retinoid Treatment for Emphysema, the Vitamin D Antenatal Asthma Reduction Trial, and the All of Us Research Program. He also conducts research at the Framingham Heart Study. He is the JAMA Associate Editor for Pulmonary Disease and Allergy.

Dr Emma O'Dowd is a Consultant Respiratory Physician at Nottingham University Hospitals NHS Trust. In 2017, she was awarded a PhD in lung cancer epidemiology entitled "Factors influencing the diagnosis and subsequent prognosis in patients with lung cancer", funded by the Roy Castle Lung Cancer Foundation. Her research interests are lung cancer screening, early diagnosis and epidemiology of lung cancer. She is a member of the National Cancer Research Institute Screening, Prevention and Early Diagnosis Group and the British Thoracic Society Lung Cancer and Mesothelioma Specialist Advisory Group.

Dr Rishi Pabary is a Consultant in Paediatric Respiratory and Sleep Medicine at Royal Brompton Hospital and Honorary Clinical Senior Lecturer at Imperial College London. His research interests include infection in cystic fibrosis, which was the subject of his PhD thesis, and childhood interstitial lung disease (chILD). He has authored chapters and peer reviewed papers and been an invited speaker at national and international paediatric conferences in the field of chILD, and is a member of the ERS chILD Clinical Research Collaboration.

Professor Dame Linda Partridge works on the biology of ageing. Her research is directed to

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understanding the mechanisms by which healthy lifespan can be extended in laboratory model organisms and humans. Her work has focussed in particular on the role of nutrient-sensing pathways and diet, and her primary interest is in geroprotective drugs. She is the recipient of numerous awards, was honoured with a DBE for Services to Science in 2009 and is a Fellow of the Royal Society. She is the founding director of the Max Planck Institute for Biology of Ageing and the Biological Secretary of the Royal Society.

Gavin Perkins is Professor of Critical Care Medicine and Director of Warwick Clinical Trials Unit, based within Warwick Medical School at the University of Warwick. His research interests relate to the care of the critically ill and injured patient in the pre-hospital and critical care setting. He co-led the RECOVERY-Respiratory Support Trial which examined the role of continuous positive airway pressure (CPAP) and high flow nasal oxygenation (HFNO) in adults with respiratory failure secondary to COVID-19.

Melanie Perry is Project Manager, Tobacco Dependency Project at the British Thoracic Society. She is managing a BTS project which involves supporting clinicians and those who provide smoking cessation within hospital acute trusts to implement and improve tobacco dependency treatment alongside the NHSE Long Term Plan delivery objectives.
Melanie has over 30 years' experience in the NHS, nursing, within secondary and primary care, followed by working within tobacco control and smoking cessation, whereby she successfully set up and led a hospital based smoking cessation service for 13 years. She teaches all grades of health care professionals and aims to deliver and reach as many as possible in order to shift the mind-set and attitudes towards smoking and its impact on the patient.

Professor Sanjay Popat is a Consultant Thoracic Medical Oncologist at the Royal Marsden Hospital and Professor of Thoracic Oncology at the Institute of Cancer Research.
His research interests include the development of novel drug strategies for the treatment of thoracic cancers through clinical trials, the identification of DNA variants that influence thoracic cancer development and their impact on clinical behaviour, as well as the identification of biomarkers predictive of therapeutic effect.
Professor Popat is Co-director for the NIHR London South Clinical Research Network (CRN) Cancer Division and Chair of Cancer for the West London Genomic Medicine Centre. He Chairs the British Thoracic Oncology Group (BTOG), and is immediate past Chair of the UK NCRI Lung Cancer Clinical Studies Group (CSG) Advanced Disease Sub-group. He is active in the European Thoracic Oncology Platform (ETOP) and the European Organization for Research and Treatment of Cancer (EORTC) Lung Group.

Dr Laura Price is a full-time Respiratory Consultant in Pulmonary Hypertension at the Royal Brompton Hospital, and an Honorary Senior Clinical Lecturer at Imperial College London. After undergraduate training in Bristol, then clinical posts in London, she completed her PhD in pulmonary hypertension pathophysiology at South Paris University and ICL. She has clinical and research interests in patients with lung disease-associated PH, small pulmonary vessel disease, and pulmonary vascular complications of COVID-19. She runs a post-COVID pulmonary vascular clinic alongside the National Pulmonary Hypertension Service at the Royal Brompton Hospital.

Carl Reynolds is a Respiratory Consultant and Chief Medical Information Officer at North Middlesex University Hospital in London and an Honorary Senior Clinical Lecturer at the National Heart and Lung Institute at Imperial College London. He has a clinical and research interest in occupational lung disease and was chief investigator for the Idiopathic Pulmonary Fibrosis Job Exposures Study (IPFJES).
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Dr Esther Robinson is Head of Public Health England's National TB Unit and a Consultant Clinical Microbiologist in the National Mycobacterial Reference Service. She was previously the Consultant in Public Health Infection for the English Midlands, with broad expertise in clinical and public health infection specialties. The TB Unit is a multidisciplinary group bringing together specialists in infectious diseases, epidemiology, TB nursing, communicable disease control and microbiology to lead surveillance, screening data, reference diagnostic, outbreak and incident response and strategic activities in support of TB elimination as a public health problem in England.
Esther has a DPhil in transferable antibiotic resistance from Oxford University and is the Mycobacterial Theme Lead for the NIHR Health Protection Research Unit in collaboration between PHE and Imperial College London. She has ongoing research interests in mycobacterial diagnostics, including whole-genome sequencing, TB transmission and non-tuberculous mycobacteria.

SPEAKERS' BIOGRAPHICAL DETAILS

Dr Helen Rodgers is a Consultant Respiratory Physician and Director of the Scottish Adult CF Service in Edinburgh. She is an Honorary Senior Clinical Lecturer, University of Edinburgh and leads the CF outreach service in Dundee. She was the CF Trust Fellow in Nottingham 1996-2000, where she completed a Doctor of Medicine, with a research interest in ion transport and inflammation in cystic fibrosis. She has been a CF consultant in Edinburgh for 18 years and is the current Chair of the BTS CF Specialty Advisory Group (SAG).

Professor Geraint Rogers is Director, Microbiome and Host Health, at the South Australian Health and Medical Research Institute, Adelaide, Infection and Immunity Lead in the Flinders University College of Medicine and Public Health, and holder of National Health and Medical Research Council and Matthew Flinders Professorial fellowships. Professor Rogers is a molecular microbiologist and microbial ecologist whose research focuses on the influence of airway microbial communities on the development and response to treatment of chronic lung diseases.

Dr Steven Rowe is a Professor in the Department of Medicine, Adjunct Faculty Member, Director, Gregory Fleming James Cystic Fibrosis Research Centre, in the Division of Paediatric Pulmonary and Sleep Medicine, University of Alabama at Birmingham.
He is a pioneer in the field of personalised therapeutics for CF, cutting-edge discovery in airway disease biology, and translational research in COPD. He is an international authority in the conduct of clinical trials targeting the basic CF defect, and has made key advances in the measurement and interpretation of CFTR function. Dr Rowe has characterised 'acquired CFTR dysfunction' in COPD patients with chronic bronchitis through a pathway that causes delayed mucociliary clearance which is now being exploited as a novel therapeutic approach. He presently has a laboratory of over 25 individuals, embracing lung research from basic discovery, to translational science, to clinical application.

Dr Sarah Rylance is the Medical Officer responsible for Chronic Respiratory Diseases at the World Health Organization headquarters, Geneva. Sarah completed specialist training in paediatrics and worked as a clinician for 20 years, including 8 years in sub-Saharan Africa. Her experiences as a doctor, researcher and teacher in Tanzania (2005-2007) and Malawi (2010-2011, 2017-2020) have fuelled her interest in developing approaches to improve the management of chronic respiratory diseases, relevant to low-income settings and consistent with the principles of Universal Health Coverage. ORCID iD: 0000-0001-6459-9073

Clare Sander is a Consultant Respiratory Physician at Cambridge University Hospital NHS Trust, Associate Clinical Lecturer at Cambridge University and Respiratory Training Programme Director for the East of England. Her main clinical interests include complex lung infections, particularly in those with primary and secondary immunodeficiency. She also manages patients with tuberculosis and non-tuberculous mycobacteria and is a member of the NTM UK Network, contributing to the Immunology Working Group. She has a long-standing interest in respiratory disease associated with haematological conditions and has established a BTS interest group in this area. She is contributing to the ERS/EBMT/CIBMTR consensus guideline on treatment of pulmonary chronic graft versus host disease.

Professor Elizabeth Sapey is Chair of the British Thoracic Society Science and Research Committee. She is an Academic Respiratory Physician at the University of Birmingham, Director of the HDR-UK Health Data Research Hub in Acute Care, PIONEER and the Managing Director of Birmingham's NIHR Clinical Research Facility. Liz's research interests focus on inflammatory respiratory diseases associated with ageing, and the impact of inflammation in an ageing host. Her interests span translational science, moving new or repurposed therapies into early phase clinical trials and using routinely collected health data to inform translational science. Liz's translational science focuses on neutrophil biology, strongly implicated in ageing and COPD related tissue damage and poor bacterial clearance.

Mirco Schmolke is Associate Professor at the University of Geneva. He studied biology at the University of Münster, Germany, did his PhD on broadly neutralising antibodies against HIV at the Robert Koch Institute, Berlin and worked since 2005 on different aspects of influenza A virus pathology. Since 2014 he has a group at the University of Geneva, Department of Microbiology and Molecular Medicine. One focus of his research is the interaction of influenza A viruses with commensal and pathogenic bacteria in the respiratory tract.

Ingrid Schoeman is a TB advocate and the Operational Manager at TB Proof. Her life was changed after contracting XDR-TB while working as a dietitian

in public hospitals in the Eastern Cape, South Africa. She was hospitalised for 75 days, of which one month was spent in the ICU for liver failure caused by the TB medication.
Ingrid is passionate about supporting community health workers as leaders to end TB (video available here: https://www.youtube.com/watch?v=IXgRxJA8WPY&t=28s)

Dr Aaron Scott is a Lecturer in Respiratory Science, within the Institute of Inflammation and Ageing, at the University of Birmingham. His research focus in respiratory inflammation covers both the acute (ARDS) and chronic setting (COPD, IPF), and investigation of the underlying disease mechanisms. Aaron is also very interested in the impact of environmental factors on lung health, most recently, investigating the impact of alternative nicotine delivery devices – electronic cigarettes and heat-not-burn tobacco devices on lung health.

Dr Chris Scotton is a Senior Lecturer in Lung Pathobiology and Head of the Respiratory Medicine Group at the University of Exeter. His current research focuses on interstitial lung disease, COPD and bronchiectasis. Through close links with the clinic and external collaborators, Dr Scotton is investigating novel therapeutic opportunities and biomarkers using a variety of multidisciplinary approaches. From 2017 – 2021, he was Chair of the British Association for Lung Research and a member of the BTS Science and Research Committee and BTS Council. He is also an Associate Editor of Thorax.

Dr Anand Shah is a Consultant Respiratory Physician in the Respiratory Infection Department at the Royal Brompton Hospital, Guy's and St Thomas' NHS Foundation Trust and an MRC funded CARP fellow at the MRC Centre of Global Infectious Disease Analysis, Department of Infectious Disease Epidemiology, School of Public Health, Imperial College London. His clinical and academic interest focusses on understanding susceptibility and improving outcome in individuals with pulmonary fungal infection. He leads an MRC-funded multicentre study to understand evolution and acquisition of antifungal resistance in chronic lung disease (FREAL), alongside a multicentre study using a 'big-data' approach to understanding fungal epidemiology (FADE-UK) and is a co-investigator on a Cystic Fibrosis UK Trust funded programme grant (TrIFIC – Targeting Immunotherapy for Fungal Infections in Cystic Fibrosis) amongst other active research programmes.

Dr Amelia Shoemark is a Principal Investigator at the University of Dundee, Scotland and lead Clinical Scientist at the Royal Brompton Hospital in London. Amelia conducts a research programme investigating cilia function in bronchiectasis. She has a specialist interest in the inherited condition, Primary Ciliary Dyskinesia (PCD). Bronchiectasis is the major cause of morbidity in patients with PCD and her research therefore focuses on diagnosis and characterisation of genetic defects in PCD, and more broadly in understanding the role of mucociliary clearance in the development of bronchiectasis in children and adults.

Dr Ian Sinha is a Consultant Respiratory Paediatrician at Alder Hey Children's Hospital, Liverpool, and Honorary Associate Professor in Child Health at the University of Liverpool. He is Clinical Lead for the NACAP Paediatric Audit, lead for NHS England work stream on diagnosing asthma in children, and member of the NICE Asthma Committee. Dr Sinha is Chief Investigator for the NIHR-funded ASYMPTOMATIC randomised trial, and has research interests in evidence-based medicine and wider determinants of child health.

Dr Deepan Sivakumar is a Consultant Chest Physician and the Clinical Lead for Pleural Diseases at Guy's and St Thomas' NHS Foundation Trust. His primary clinical research interests include health related quality of life outcomes in malignant pleural disease and the neurophysiological effects of pleural effusion.

Professor Alan Smyth is Professor of Child Health at the University of Nottingham and Honorary Consultant in Paediatric Respiratory Medicine at Nottingham Children's Hospital. His clinical focus is cystic fibrosis (CF) and his research interests include effective ways to treat infection in CF and minimising the adverse effects of treatment. He has led a patient engagement exercise which has defined new research priorities, including research into the causes of gastrointestinal symptoms in CF. Professor Smyth is now engaged in discovery science, using MRI imaging in this area. He is joint Editor in Chief of the journal Thorax and Co-ordinating Editor of the Cochrane Cystic Fibrosis and Genetic Disorders Group. When not working, he is a keen cyclist and pilot.

Dr Helen Spencer is a Paediatric Respiratory Consultant and is the Director of the Cardiothoracic Transplant Unit at Great Ormond Street Hospital NHS Foundation Trust. She graduated in Manchester and completed her MD on Stem Cells in the Lung at the

University of London. Her clinical and research interests include end stage CF lung disease, NTM infection and pulmonary hypertension. She is the Chair of the Association of Lung Transplant Physicians and a member of the Cardiothoracic Advisory Group. Twitter @DrHelenSpencer

Dr Andrew Stanton is a Consultant at the Freeman Hospital in Newcastle where he leads the pleural service and contributes to the lung cancer and severe asthma services. He completed registrar training in Oxford and was consultant at the Great Western Hospital in Swindon for nine years before moving to the North East in 2019. He has been a member of the BTS Pleural Specialist Advisory Group and helped deliver the recent BTS training standards in thoracic ultrasound. He is a member of the current BTS Pleural Disease Guideline Development Group and has been an active recruiter to various multicentre trials in pleural disease.

Michael Steiner is Professor of Respiratory Medicine at the University of Leicester, Honorary Consultant Respiratory Physician at University Hospitals of Leicester, and Honorary Clinical Professor at Loughborough University. His sub-speciality clinical interests include management of advanced COPD, lung volume reduction therapies, sleep, and home non-invasive ventilation. His research interests focus on chronic disease management and quality improvement in COPD with particular expertise in exercise performance, physical training, pulmonary rehabilitation, nutrition and skeletal muscle dysfunction. He was Clinical Lead for the Pulmonary Rehabilitation component of the National COPD Audit Programme 2013-18.

Carol Stonham MBE. Following 26 years working in general practice, Carol now works at Gloucestershire CCG on the Respiratory Clinical Programme Group and runs a locality-based asthma FeNO service. Carol has also been appointed as a co-clinical lead of the NHSE South West Respiratory Network.
Carol is current Executive Chair of PCRS – the first non-doctor and first female to take the chair. She is also a director of the UK Lung Cancer Coalition, and a board member of the UK Inhaler Group and National Asthma and COPD Audit as well as sitting on the NHS Long Term Plan Respiratory Delivery Board. She also co-chairs the Lung Health Task Force Early and Accurate Diagnosis Group and is a member of the NHS Long Term Plan Breathlessness Diagnosis group. Carol received the Queen's Nurse award in 2007 and in 2016 was awarded an MBE in the Queen's New Year Honours list for Services to Nursing and Healthcare.

Dr Tara Sutherland is Research Fellow in the Lydia Becker Institute of Immunology and Inflammation and Wellcome Centre for Cell-Matrix Research, University of Manchester. She completed both her BSc and PhD degrees at the University of Melbourne, Australia, before moving to the UK. Dr Sutherland uses model systems including parasite infection and allergic airway inflammation to study how the host immune response develops during pathology and is involved in regulating tissue injury and repair. More recently, the lab works on investigating cross-regulation between the extracellular matrix and immune/stromal cells and how these interactions lead to long-term pathological changes in the lung in asthma and during COVID-19 infection.

Amanda Tatler is a Senior Research Fellow/Assistant Professor within the NIHR Nottingham Respiratory Biomedical Research Centre, University of Nottingham, having previously trained at the University of California San Francisco and Harvard Medical School. Her research aims to understand tissue remodelling processes in respiratory diseases including asthma, pulmonary fibrosis, COPD and viral infections. She has a keen interest in ex vivo tissue models of disease and her current work aims to develop a "breathing" lung slice model. Amanda is Secretary of the British Association for Lung Research, and sits on the editorial board of Frontiers in Allergy.

Dr Muhunthan Thillai is a chest physician within the Interstitial Lung Diseases Unit at Royal Papworth Hospital, Cambridge. His research interests are primarily two-fold. Firstly, sarcoidosis where he has a clinical interest in the diagnosis of both pulmonary and cardiac sarcoid. He has recently held grants from the British Thoracic Society and the Foundation for Sarcoidosis Research and was the co-chair of the 2020 BTS Sarcoidosis Guidelines. Secondly, in machine learning of CT images and related clinical data to monitor idiopathic pulmonary fibrosis and other ILDs.

Ryan Thwaites is an immunologist at the National Heart and Lung Institute, Imperial College London, with a particular interest in the mucosal immune response to respiratory viruses. Ryan's studies of COVID-19 range from the ISARIC4C consortium of natural infection to the first-in-man human challenge model of SARS-CoV-2. These complementary studies enable characterization of the full breadth of COVID-19 pathogenesis.

SPEAKERS' BIOGRAPHICAL DETAILS

Dr Selina Tsim is a Macmillan Consultant Respiratory Physician with a specialist interest in mesothelioma, lung cancer and pleural disease at the Queen Elizabeth University Hospital in Glasgow. She is a Clinical Lead of the Macmillan Scottish Mesothelioma Network and co-chairs the Scottish National Mesothelioma MDT. Selina is an NHS Research Scotland Career Research Fellow and Honorary Clinical Senior Lecturer at the Institute of Cancer Sciences, University of Glasgow. Her research interests include biomarkers and imaging in pleural malignancy and the pleural microbiome.

Benoit Van den Eynde is Professor of Tumour Immunology at Oxford University, Member of the Ludwig Institute for Cancer Research, and Director of de Duve Institute in Brussels, Belgium. He leads research groups active in cancer immunotherapy, with a focus on the identification and study of tumour antigens, the development of cancer vaccines, the study of immunosuppressive mechanisms in the tumour micro-environment, and the preclinical development of new immuno-oncology drugs. He co-founded iTeos Therapeutics and sits on the scientific advisory boards of several biotech and pharma companies.

Professor Martina Koziar Vasakova graduated from the Faculty of General Medicine of Charles University in Prague. She obtained attestations from internal medicine, tuberculosis and respiratory disease, allergology and clinical immunology, specialization in bronchology and license in interventional bronchology. In 2015, she was appointed as a Professor of Internal Medicine, and in 2016, she became the Head of the Department of Pneumology at the First Faculty of Medicine Charles University and Thomayer University Hospital. She is the President of the Committee of the Czech Pneumological and Ftizeological Society, a board member of the Czech Asthma Initiative and member of the Council of Immunology at Charles University, then for ChILD COST - Vice-Chairman of WG 5 – Transition of care. She is also at the ERN Lung ILD responsible for cross boarder care.
The clinical and scientific research work of Professor Vasakova focuses in general on immunopathology of lung diseases. She is recognised for her contribution to education and research work in interstitial lung diseases, namely idiopathic pulmonary fibrosis and in hypersensitivity pneumonitis. She is also a founder and head of one of the biggest registries of idiopathic pulmonary fibrosis in the world, the EMPIRE registry, which offers data for clinical research of this serious lung disease and is a platform for real-world, investigator-initiated studies in this debilitating disease.

Professor François Vermeulen is an Assistant Professor at the KU Leuven, and works as a pediatric pulmonologist in the CF Reference Centre of the UZ Leuven. He obtained his medical degree in 1997, completed his specialisation in pediatrics in 2002 at the UC Louvain, and concluded with a training in pediatric pulmonology at the KU Leuven in 2003. He obtained a PhD in biomedical sciences in 2018, under the supervision of Professor De Boeck.
Professor Vermeulen has been investigator in numerous clinical trials involving patients with CF, including commercial trials of (new) therapies for CF and non-commercial trials about clinical endpoints for CF. He is currently involved in translational research focusing on rectal organoids as precision medicine tools for the treatment of patients with CF, running two large projects (as PI of the Belgian Organoid Project, funded by the Belgian CF Patient Association and as Belgian PI for the H2020 funded HIT-CF trial). Professor Vermeulen has been an active member of the ECFS Diagnostic Network Working Group for 15 years, which has helped to build a network of CF physicians with special interest in CF diagnosis.

Professor Ioannis Vogiatzis Professor of Rehabilitation Sciences, Department of Sport, Exercise and Rehabilitation, Faculty of Health and Life Sciences and Honorary Professor of Cardiopulmonary Exercise Testing and Rehabilitation, Northumbria Healthcare NHS Foundation Trust.
He is an internationally recognised scientist in the area of pulmonary rehabilitation in respiratory disease. He contributes his expertise to educational and research curriculum development activities undertaken by the ERS. He has co-authored six Official Position Statements on clinical exercise, and pulmonary rehabilitation in respiratory patients, which have been published by the American Thoracic and European Respiratory Societies. He is the Secretary of the Respiratory, Clinical Care and Physiology Assembly and member of the Digital Health Working Group of the ERS, a member for the COPD Development Group of the World Health Organisation Rehabilitation Programme, and member of the BTS Specialist Advisory Group for Pulmonary Rehabilitation.

Dr Aashish Vyas is a respiratory consultant at Lancashire Teaching Hospitals Trust. He Leads the Regional Severe Asthma Service, as well has being head of the Lancashire and South Cumbria long-term home

ventilation and complex weaning unit. His team's specialist interests are centred around upper airway dysfunction and complex breathlessness. Dr Vyas currently is a member of the BTS Council and the Science and Research Committee as well as having had prior involvement in the BTS Asthma Specialist Advisory Group.

Dr Steve Walker is an NIHR Academic Clinical Lecturer and Specialist Registrar in Respiratory Medicine. His research interests are focused on non-malignant pleural disease, and he has recently completed randomised trials on pneumothorax and transudative pleural effusions management. He is a current member on the forthcoming BTS Pleural Disease and ERS Spontaneous Pneumothorax Guidelines.

George R Washko is Associate Professor of Medicine, Harvard Medical School and Associate Physician at Brigham and Women's Hospital, Division of Pulmonary and Critical Care Medicine, Department of Medicine. He is a clinical investigator with a focus on chronic parenchymal lung disease. He began his career participating in therapeutic and device-based trials for patients with advanced COPD and quickly gravitated to imaging as a means to understanding disease heterogeneity. For the past 15 years, his group has been developing techniques to identify image-based biomarkers used for disease detection, stratification and prognostication. More recently, they have shifted their efforts to leverage imaging as an intermediate study endpoint for clinical investigation. Finally, his group is working to translate techniques deployed in highly curated research cohorts to data acquired during routine clinical care.

Wisia Wedzicha is Professor of Respiratory Medicine, Head of the Respiratory Division at the National Heart and Lung Institute, Imperial College and Honorary Consultant at Royal Brompton and Harefield Hospitals. She qualified from Somerville College, Oxford University and St Bartholomew's Hospital Medical College. She was elected as Fellow of the Academy of Medical Sciences (FMedSci) and is a Fellow both of the American Thoracic Society (ATSF) and European Respiratory Society (FERS). She received the Helmholtz International Fellow Award in 2014. Professor Wedzicha has a major interest in the causes, mechanisms, impact and prevention of chronic obstructive pulmonary disease (COPD) exacerbations, and in the role of bacterial and viral infection in COPD exacerbations. She directs an active research group specialising in COPD exacerbations, and has published extensively on this topic.
Professor Wedzicha was Editor-in-Chief of Thorax from 2002 to 2010 and is currently Editor in Chief for the American Journal of Respiratory and Critical Care Medicine. She was the Lancet Ombudsman until 2014, Publications Director for the European Respiratory Society (ERS) and has also previously been ERS Guidelines Director.

Martin Wildman is a Consultant in Respiratory Medicine and Adult Cystic Fibrosis at Sheffield Teaching Hospital. He was trained in health services research during a four-year MRC training fellowship at the London School of Hygiene and Tropical Medicine. He is interested in understanding how behaviour change focused on habit formation and improvement science can support sustained system optimisation via the MRC complex interventions pathway. Current work focuses on evaluating the NICE Cystic Fibrosis quality indicator (https://www.nice.org.uk/standards-and-indicators/nlindicators/normative-adherence-to-nebulised-therapy-in-cystic-fibrosis-for-patients-with-chronic-pseudomonas-acquisition) within the CFHealthHub Digital Learning health system (https://www.cfhealthhub.com/)

Professor Tom Wilkinson is Professor of Respiratory Medicine at the University of Southampton, Faculty of Medicine and Honorary Consultant at University Hospitals Southampton. He trained at the University of Cambridge and Barts and the London School of Medicine and completed his PhD at UCL studying disease mechanisms driving infective exacerbations of COPD. He is Lead of the Southampton COPD Research Group, the Respiratory Theme of the NIHR Southampton Biomedical Research Centre and Respiratory Section Lead in Clinical and Experimental Sciences. His research seeks to improve understanding of the mechanisms which drive susceptibility to respiratory infections and exacerbations in patients with chronic lung disease, and to develop new vaccines and therapies to impact on these. Tom has taken these mechanistic discoveries through translation into new treatments in COPD and COVID-19. He was Co-chair of the British Thoracic Society Home Oxygen Guidelines Standards of Care Committee, contributed to the national nutritional guidance for COPD, is Associate Editor for the journal Thorax and is co-founder and Chairman of the health technology company myMHealth. He has published over 150 peer reviewed papers and reviews on the topics of airways disease, infection and airway immunology.

EXHIBITORS' INFORMATION

Action for Pulmonary Fibrosis (APF) is a growing community of patients, families, researchers and healthcare professionals striving to find a cure for pulmonary fibrosis so everyone affected by the disease has a better future. We provide personalised support to patients and families and raise awareness of pulmonary fibrosis through campaigning, fundraising and education. We are also committed to funding research to improve the quality of life for people living with pulmonary fibrosis today and tomorrow.

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The Association of Respiratory Nurse Specialists (ARNS) is a membership association and nursing forum to champion the specialty respiratory nursing community, promote excellence in practice, and influence respiratory health policy. ARNS also works to influence the direction of respiratory nursing care.

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EXHIBITORS' INFORMATION

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References 1. Sandoz. https://www.sandoz.com/about-us/who-we-are/our-purpose-and-ambition
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BTS/BALR/AUK-BLF Early Career Investigator Symposium

T1 THE LOCAL AND SYSTEMIC RESPONSE TO SARS-COV-2 INFECTION IN CHILDREN AND ADULTS

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10.1136/thorax-2021-BTSabstracts.1

Introduction and Objectives Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is responsible for the current coronavirus disease 2019 (COVID-19) pandemic. Whilst a substantial proportion of adults infected with SARS-CoV-2 progress to develop severe disease, children rarely manifest respiratory complications. However, the underlying mechanism behind this disparity remains largely unknown. Understanding the differences in the local and systemic response to SARS-CoV-2 infection at single cell resolution between children and adults may offer key clues about the pathogenesis of SARS-CoV-2 infection, providing guidance for future therapies and treatments.

Methods To address this we generated a healthy reference multi-omics single cell data set from children (n=30) from infancy to adulthood (n=11). Here we profiled triple matched samples: nasal and tracheal brushings and PBMCs for single cell analysis, where we tracked the developmental changes for 59 airway and 45 blood cell populations at both transcriptomic and proteomic level. These were then contrasted with equivalent data from paediatric and adult COVID-19+ patients collected across a range of disease severities (total n=32), enabling age and disease-specific variances to be analysed at single cell level.

Results Striking differences within the paediatric and adult immune responses in COVID-19 were observed, including an overall weaker interferon-response signature, with fewer interferon-stimulated immune cell subpopulations within children infected by SARS-CoV-2 compared to adults. In peripheral blood, a greater proportion of naïve cell populations was observed with disease, with the response in adults primarily dominated by the adaptive immune system. In the airway epithelium, we found the highest viral load in goblet and ciliated cells in infected adults and most notably, described a novel inflammatory epithelial cell population, enriched within our COVID-19 patients, representing a transitional regenerative state between secretory and ciliated cells. Through the integration of matched blood and airway samples we were able to investigate the dynamics between local and systemic response to COVID-19, finding marked differences.

Conclusions Overall, this largest paediatric single cell COVID-19 study to date showed significant differences in response to SARS-CoV-2 between children and adults, reflecting the changes of the immune landscape over developmental time, which in children are dominated by naïve and innate responses.

T2 CLUSTER ANALYSIS OF TRANSCRIPTOMIC DATASETS TO IDENTIFY ENDOTYPES OF IDIOPATHIC PULMONARY FIBROSIS

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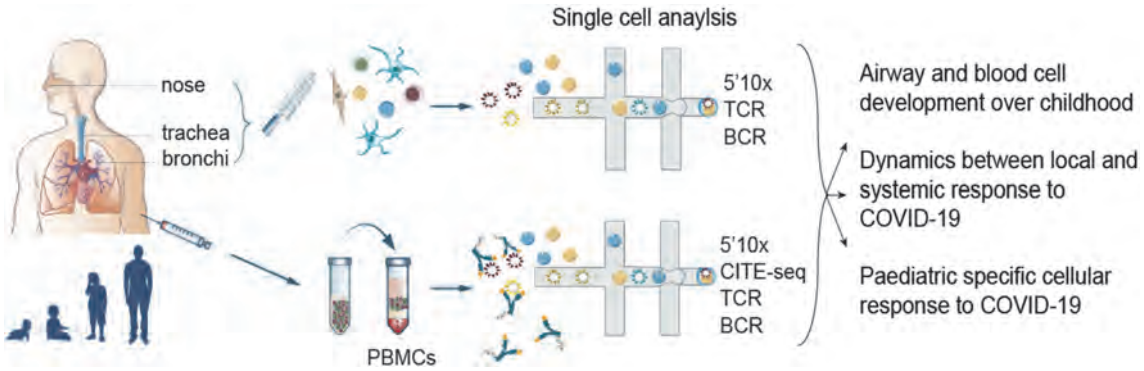
Rationale Considerable clinical heterogeneity in Idiopathic Pulmonary Fibrosis (IPF) suggests the existence of multiple disease endotypes. Identifying these endotypes could allow for



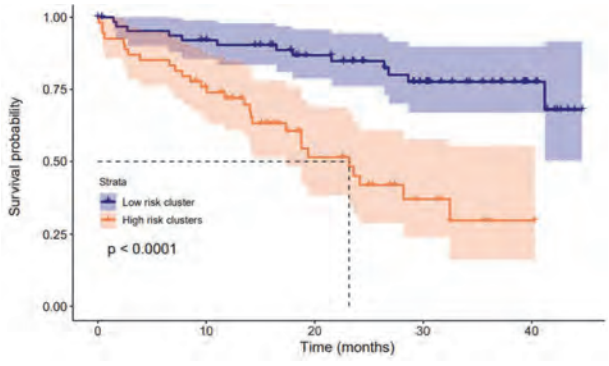
Abstract T1 Figure 1

the development of a biomarker-driven personalised medicine approach in IPF.

Objectives To improve our understanding of the pathogenesis of IPF by identifying clinically distinct groups of patients with IPF that could represent distinct disease endotypes.

Methods We systematically selected three publicly available datasets containing gene expression data measured from whole blood (220 IPF cases total). These datasets were co-normalised, pooled and clustered. We then compared clinical and demographic traits across clusters and used gene enrichment analysis to identify biological pathways and processes that were over-represented among the genes that were differentially expressed across clusters. A classifier was developed to assign additional individuals with IPF to a cluster using expression data from a minimal number of genes. We validated the classifier using three additional independent datasets (194 IPF cases total) and compared its performance at predicting survival in IPF to that of a previous transcriptomic prognostic biomarker for IPF.

Results We identified three clusters of IPF patients with distinct transcriptomic signatures. These clusters demonstrated statistically significant differences in lung function (P=0.009) and mortality (P=0.009) between groups. One cluster appeared to consist of patients with favourable lung function and survival over time (low risk cluster), whilst the other two clusters contained patients with worse lung function and reduced survival (high risk clusters). Gene enrichment analysis implicated dysregulation of mitochondrial homeostasis, apoptosis, cell cycle and innate and adaptive immunity in the pathogenesis of these groups. We developed and validated a 13-gene cluster classifier that predicted mortality in IPF (figure 1).



Abstract T2 Figure 1 Survival over time for the IPF subjects in the validation datasets, stratified by risk group according to our 13-gene classifier. The P-value on the plot is from a log-rank test testing the two curves for equality. The dashed line on the plot indicates the median survival time for the risk group if this could be calculated

Conclusions There are at least two groups of IPF patients with significant differences in survival and lung function that are discernible by blood gene expression signatures. These groups could be representative of distinct pathophysiological states, which would support the theory of multiple endotypes of IPF. Although more work must be done to confirm the existence of these endotypes, our classifier could be a useful tool in patient stratification and outcome prediction in IPF.

T3 INTEGRATED TRANSCRIPTOMIC ANALYSIS OF HUMAN TUBERCULOSIS GRANULOMAS AND A BIOMIMETIC MODEL IDENTIFIES SPHINGOSINE KINASE 1 AS A POTENTIAL THERAPEUTIC TARGET

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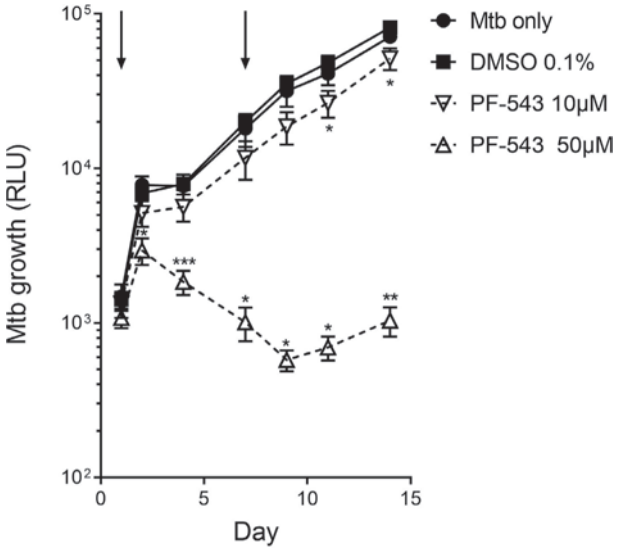
10.1136/thorax-2021-BTSabstracts.3

The global burden of tuberculosis (TB) continues at pandemic proportions, currently with a quarter of the world's population infected with *Mycobacterium tuberculosis* (Mtb), and 1.4 million people dying from TB in 2019 (WHO, 2020). Mtb has undergone prolonged co-evolution with humans, with the balance between protective and pathological host responses likely to play a key role in determining clinical severity. Sarcoidosis is another granulomatous condition primarily affecting the lung and lymph nodes. TB and sarcoidosis share histological and clinical features, which can be indistinguishable, including immune-related phenomena which suggest shared immunological processes. Despite scientific advances, the immunopathology of TB and sarcoidosis remain incompletely understood. Here, we show the combination of unbiased analysis of patient samples and a biomimetic model has established a translational pipeline to identify new therapeutic approaches.

We hypothesised that whole transcriptome analysis of human TB granulomas isolated by laser capture microdissection could identify therapeutic targets, and that comparison with sarcoidosis would identify disease-specific mechanisms.



Abstract T3 Figure 1 Mtb growth detected in 3D collagen model measured by luminescence (RLU, relative light units): untreated (black circles), DMSO (black squares), and SphK1 inhibitor PF-543 (unfilled triangles). Black arrows: drug addition on days 1 and 7. Experiments were performed on at least five occasions using PBMCs from five separate healthy donors with triplicate conditions. Data presented are from a representative donor and are consistent across donors. Analysis: two way ANOVA with Dunnett's Multiple Comparison Test, error bars: SD.
*p<0.05, **p<0.01, ***p<0.001

Treatment-naïve biopsies were analysed from seven TB patients, ten sarcoidosis patients and seven control samples. Bioinformatic analysis of RNAseq data identified one third of differentially expressed genes were communal to TB and sarcoidosis relative to control samples (absolute $\log_2$ fold change $\geq$ 1.5, adjusted P value < 0.05), with overlap of numerous pathways, including the extracellular matrix and cytokine signalling. Importantly, a TB unique cluster demonstrates TB results from a dysregulated inflammatory immune response, whereas a sarcoidosis predominant cluster relates to elevated lysosomal activity.

To translate these insights, we compared three primary human cell culture models: classical 2D; 3D alginate; and 3D collagen model. We demonstrated the Mtb-infected 3D collagen model most closely reflected clinical TB biopsies. We investigated signalling pathways shared between human disease and the 3D model, and used a systematic selection process to identify twelve intracellular enzymes as potential therapeutic targets. Sphingosine kinase 1 (SphK1) inhibition controlled Mtb growth in a dose-dependent manner, concurrently lowering intracellular pH in infected monocytes and suppressing inflammatory mediator secretion. Immunohistochemical staining confirmed that SphK1 is expressed in human lung TB granulomas, and therefore represents a potential novel host-directed therapeutic target to improve TB outcomes.

T4 REINFECTION WITH INFLUENZA A VIRUS LEADS TO RAPID CHANGES IN IMMUNOMODULATORY MOLECULES AND INFLAMMATORY SUBTYPES OF LUNG FIBROBLASTS AND EPITHELIAL CELLS

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10.1136/thorax-2021-BTSabstracts.4

Introduction and Objectives Influenza A virus (IAV) induces respiratory infections resulting in significant global mortality. Stromal cells are essential sources of chemokines and growth factors that promote immune cell survival and anti-viral responses. The concept that stromal cells are permanently altered by inflammatory responses is referred to as trained immunity. We hypothesise that IAV infections influence future immune responses *via* changes to lung stromal cells, enabling rapid communication with immune cells following subsequent infection.

Methods C57BL/6 mice were infected intranasally with IAV (WSN, 150PFU) for 30 days and subsequently re-challenged with IAV (X31, 200PFU) for 2 days. Mice were sacrificed at day 0, 2, 30 and 32 post infection. A Nanostring assay was used to examine the transcriptional profiles of FACS sorted lung fibroblasts and epithelial cells. Differentially expressed genes were validated by qPCR and flow cytometry. The expression of upstream transcriptional drivers of these changes were compared with publicly available RNA-seq and ChIP-seq datasets. The potential impact of these changes on stromal-immune cell communication were assessed using immunohistochemistry and immunofluorescence.

Results Genes involved in T cell communication were significantly upregulated in lung fibroblasts (Cd274, Cxcl10) and epithelial cells (Tnfsf10, Icam2) following secondary IAV infection (d32), compared to d30. These changes were accompanied by elevated IFN-response genes (Bst2, Ifi47, Irf7). Fibroblasts displayed enrichment in genes involved in biological processes regulating T cell activation, while epithelial cells were enriched for genes that regulate cytokines (IFNα/β, TNFα). After secondary IAV infection, stromal cells rapidly upregulated genes involved in antigen processing and presentation (Tap1, Tapbp), compared to d30. The transcription factor SpiB was identified as a shared upstream regulator of these genes. Interestingly, in contrast to d2 post primary infection, MHCII+ epithelial cells were elevated following secondary infection, while the frequency of IFN-responsive fibroblasts was decreased. T and B cells were located near airway epithelial cells at d30 and were retained following secondary infection, indicating ongoing communication between these cells.

Conclusions Our data, show that lung fibroblasts and epithelial cells can display overlapping and functionally discrete responses to IAV infection, enabling them to rapidly communicate with lung T cells following a subsequent infection.

Please refer to page A188 for declarations of interest related to this abstract.

T5 RESPIRATORY PARTICLE AND DROPLET EMISSION DURING SPEECH AND EXERCISE

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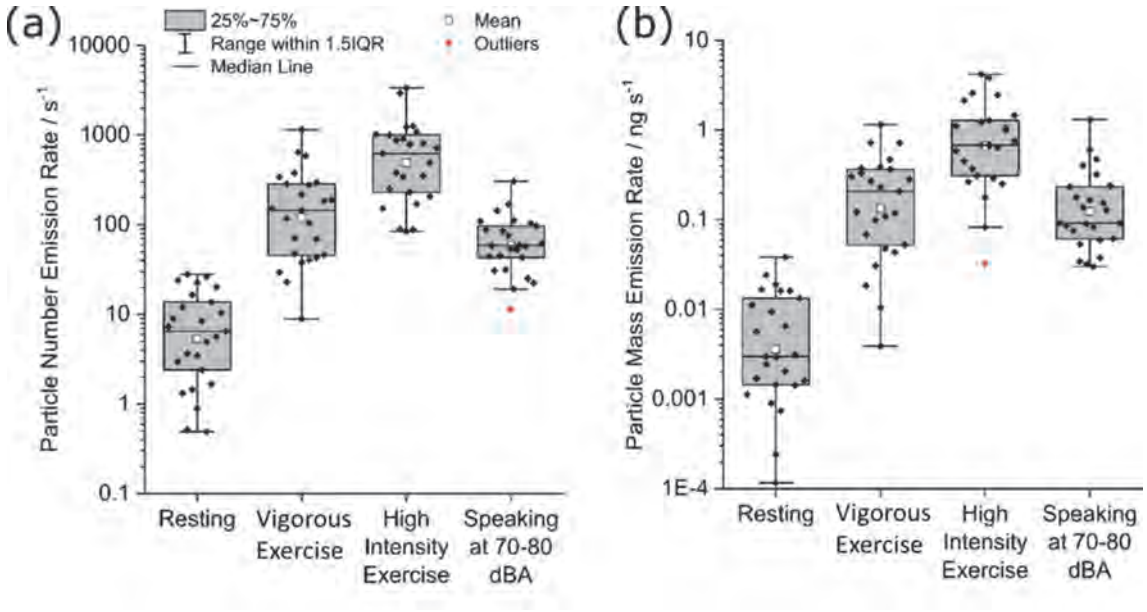
10.1136/thorax-2021-BTSabstracts.5

Background The coronavirus disease-19 (COVID-19) pandemic has profoundly impacted sports and exercise, disrupting a plethora of events worldwide. Aerosol transmission is increasingly recognised as an important route for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), with systematic evaluation of particulate matter release during exercise required to understand and mitigate transmission risk.

Methods Healthy participants (n=25) performed a two stepped, flat-wave cardiopulmonary exercise test (CPET) on a cycle ergometer to replicate vigorous exercise (80% of anaerobic workload) and high intensity exercise (anaerobic workload + 30% of the difference between anaerobic workload and peak workload), as determined by a maximally exhaustive CPET performed one hour previously. Concurrent measurements of aerosol and ventilatory data were recorded via a sampling line connected to an aerodynamic particle sizer (APS). Further synchronous data were collected at rest and when speaking at 70-80dBA. Droplet data were collected at rest and during high intensity exercise, using water sensitive paper.

Findings Median aerosol number concentration during speaking (at 70-80dBA), 0·26cm^{-3}, was greater than during vigorous exercise, 0·12 cm^{-3} ($p<0·001$) but not different to high intensity exercise, 0.24cm^{-3} ($p=0·92$). Median aerosol mass concentration during speaking, 0·40$\mu g/m^{-3}$, was greater than during vigorous exercise (0·17$\mu g/m^{-3}$,$p<0·001$), but not different to



Abstract T5 Figure 1 Box and whisker plots showing (a) Aerosol number emission rates (aerosol number concentration normalised for ventilation) (b) Aerosol mass emission rates (aerosol mass normalised for ventilation) across the same series of activities, for all 25 participants

high intensity exercise (0·42µg/m^{-3},p=0·083). Rest and exercise demonstrated similar aerosol size distributions, however speaking emitted an additional, larger mode at 2–3µm. Mean minute ventilation was 11L/min, 15L/min, 63L/min and 114L/min at rest, speaking, vigorous exercise and high intensity exercise, respectively. Median mass emission rate (aerosol mass concentration normalised for ventilation) produced by speaking, 0·092ng/s^{-1}, was not different to vigorous exercise, 0·207ng/s^{-1}, (p=0·726) but was lower than high intensity exercise 0·682ng/s^{-1}, p<0.001).

Interpretation The size distribution of airborne particles emitted during exercise, match that of breathing at rest, with increased minute ventilation a primary driver of the increased aerosol mass emissions that occur during exertion. Aerosol mass emission rates during vigorous exercise are not different to speaking at a conversational, to loud conversational volume. These findings enhance our understanding of particle release during the fundamental physiological process of exercise, enabling appropriate mitigations for airborne pathogens, including SARS-CoV-2.

Funding The PERFORM 2 study was funding by EPSRC.

T6 THERAPEUTICALLY TARGETING PTBP1/PKM2-DRIVEN GLYCOLYSIS IN ENDOTHELIAL CELLS: A NOVEL APPROACH TO TREAT PULMONARY ARTERIAL HYPERTENSION

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Background Pulmonary Arterial Hypertension (PAH) is an often-fatal disease, characterised by the development of apoptosis-resistant, hyperproliferative, and hyper-glycolytic endothelial cells (ECs). Loss-of-function *BMPR2* mutations and metabolic dysfunction are pivotal to PAH EC dysfunction. Enhanced expression of glycolysis enzyme pyruvate kinase M2 isoform (PKM2) and upstream splicing factor poly-pyrimidine tract binding protein (PTBP1) have been observed regardless of genetic background,[1] suggesting that targeting the PTBP1/PKM2 axis could be a potent therapeutic strategy in PAH. Apigenin has been recognised for its low toxicity and ability to suppress PTBP1 and PKM2-driven Warburg glycolysis and tumorigenesis.[2] This work investigates apigenin's effects on the PKM2/PTBP1 axis in ECs; whether treatment could correct hallmark characteristics of PAH EC dysfunction; and the influence of *BMPR2* mutations.

Methods Here, we examined the proteomic, metabolic and functional profiles of blood outgrowth endothelial cells (BOECs) obtained from healthy control volunteers and PAH patients with *BMPR2* mutations, following apigenin treatment or *PTBP1*/*PKM2* knockdown. We hypothesised that, apigenin treatment would reduce glycolysis by inhibiting PTBP1 driven splicing of *PKM* into *PKM2*, and PKM2-dependent expression of glycolytic pathway components, such as lactate-dehydrogenase A (LDHA) and lactate production.

Results In control and *BMPR2* mutant BOECs, apigenin inhibited expression of PTBP1 and tetrameric PKM2. In control and *BMPR2* mutant BOECs, apigenin also suppressed LDHA protein expression and lactate production. Apigenin inhibited cell cycle progression and caspase 3/7 activity in control and *BMPR2* mutant BOECs, suggesting treatment may reduce EC susceptibility to proliferation and apoptosis, hallmarks of PAH ECs.

Conclusions Apigenin treatment may suppress EC glycolysis, possibly through suppression of PKM2-driven glycolytic gene expression and tetrameric activity. This encouraging data suggests apigenin may correct endothelial cell dysfunction observed in PAH, including susceptibility to apoptosis and proliferation.

REFERENCES

1. Caruso P, *et al*. Identification of MicroRNA-124 as a Major Regulator of Enhanced Endothelial Cell Glycolysis in Pulmonary Arterial Hypertension via PTBP1 (Polypyrimidine Tract Binding Protein) and Pyruvate Kinase M2. *Circulation* 2017;**136**:2451–2467.
2. Shan S, *et al*. Apigenin restrains colon cancer cell proliferation via targeted blocking of pyruvate kinase M2-dependent glycolysis. *J Agric Food Chem* 2017;**65**:8136–8144.

The clinical management of acute asthma

S1 OBESE, NON-EOSINOPHILIC ASTHMA: FREQUENT EXACERBATORS IN A REAL-WORLD SETTING

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10.1136/thorax-2021-BTSabstracts.7

Introduction In the UK, asthma deaths are at their highest level this century (1). Increased recognition of at-risk patients is needed. This study phenotyped frequent asthma exacerbators, and used machine learning to predict frequent exacerbators. We hypothesised that frequent exacerbators would have more severe peripheral eosinophilia than infrequent exacerbators.

Methods Patients admitted to Watford General Hospital with an asthma exacerbation between 1st March 2018 – 1st March 2020 were included. Patient data was retrospectively collected from hospital and primary care records. Patients were organised into two groups: "Infrequent Exacerbator" (1 admission in the previous 12 months) and "Frequent Exacerbator" (≥2 admissions in the previous 12 months). Good adherence to inhaled corticosteroids (ICS) was defined as medication possession ratio (MPR) ≥0.8; poor adherence was defined as MPR ≤0.5. Machine learning models were used to predict frequent exacerbators.

Results 200 patients admitted for asthma exacerbations were randomly selected (73% female; mean age 47.8 ± 19.3 years; table 1). Peripheral eosinophilia was uncommon in either group (19% vs 21%). More frequent exacerbators were being treated with high-dose ICS (46.5% vs 23.2%; P < 0.001), and frequent exacerbators used more SABA inhalers (10.9 vs 7.40; P = 0.01) in the year preceding the current admission. Good adherence to ICS was similarly low between both groups (40.0% vs 48.3%). BMI was raised in both groups (34.2 vs 30.9). Logistic regression classifier was the most accurate machine learning model for predicting frequent exacerbators (AUC = 0.80).

Abstract S1 Table 1 Characteristics of patients admitted for asthma exacerbations

	Infrequent Exacerbators	Frequent Exacerbators	P Value
n	100	100	
Age, years	46.5 ± 20.9	49.0 ± 17.5	0.25
Female (%)	69.0	77.0	0.20
Ethnicity (%)	Caucasian 82.0	Caucasian 83.0	0.85
	Asian 15.0	Asian 13.0	0.68
	Afro-Caribbean 1.0	Afro-Caribbean 1.0	1.00
Exacerbations managed in primary care in the last 12 months	0.79 ± 1.15	1.92 ± 1.83	<0.001***
FEV1/FVC (%)	71.0 ± 13.4	70.9 ± 16.8	0.96
Obstructive lung function (%)	34.5	39.1	0.60
FeNO, ppb	42.3 ± 57.1	24.8 ± 13.6	0.97
High FeNO (%)	27.3	12.5	0.44
Blood eosinophils, $x10^9$/L	0.27 ± 0.39	0.32 ± 0.41	0.45
Eosinophilia (%)	19.0	21.0	0.72
Blood neutrophils, $x10^9$/L	7.91 ± 3.87	7.70 ± 3.11	0.87
Neutrophilia (%)	45.0	49.0	0.57
Total IgE, kU/L	470.3 ± 870.3	378.9 ± 755.1	0.18
High IgE (%)	68.2	52.9	0.11
Patients with CT scan changes (%)	78.0	90.2	0.09
ICS-LABA (%)	60.6	88.9	<0.001***
High-dose ICS (%)	23.2	46.5	<0.001***
Long-term OCS (%)	3.03	10.1	0.04*
OCS courses in past year	0.99 ± 1.21	2.06 ± 2.34	0.005**
SABA dispensed in past year	7.40 ± 7.89	10.94 ± 9.39	0.01*
SABA overuse (%)	64.8	78.6	0.58
ICS MPR	0.72 ± 0.44	0.72 ± 0.40	0.66
Good ICS adherence (%)	48.3	40.0	0.35
Poor ICS adherence (%)	36.7	30.8	0.49
Past Medical History			
COPD (%)	5.10	3.03	0.46
GORD (%)	30.6	46.5	0.02*
Depression (%)	29.6	32.3	0.68
Ex or current smoker (%)	64.5	69.9	0.51
BMI	30.9 ± 6.06	34.2 ± 9.48	0.14
Obese (%)	63.4	63.6	0.98
Follow-up within 4 weeks (%)	54.0	67.0	0.06

Data presented as mean ± standard deviation, unless stated differently.
FEV1/FVC: ratio of Forced Expiratory Volume in 1 second to the Forced Vital Capacity. FeNO: fractional exhaled nitric oxide. ICS: inhaled corticosteroid. LABA: long-acting β_2-agonist. OCS: oral corticosteroid. SABA: short-acting β_2-agonist. MPR: medication possession ratio. COPD: chronic obstructive pulmonary disease. GORD: gastro-oesophageal reflux disease.
High FeNO defined as FeNO >40. Eosinophilia defined as blood eosinophils ≥$0.5x10^9$/L. Neutrophilia defined as blood neutrophils ≥$7.2x10^9$/L. High IgE defined as serum IgE ≥81 kU/L. Good ICS adherence defined as ICS MPR ≥0.8. Poor ICS adherence defined as ICS MPR ≤0.5. SABA overuse defined as ≥3 SABA inhalers per year.

Conclusions Patients admitted for asthma are predominately female, obese and non-eosinophilic. Patients who require multiple admissions per year have poorer asthma control at baseline. Machine learning algorithms can predict frequent exacerbators using clinical data available in primary care. Instead of simply increasing the dose of corticosteroids, multidisciplinary management targeting Th2-low inflammation should be considered for these patients, including weight loss regimens, reflux management and macrolide therapy.

S2 DERIVATION OF A PROTOTYPE ASTHMA ATTACK RISK SCALE CENTRED ON BLOOD EOSINOPHILS AND EXHALED NITRIC OXIDE

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Rationale Reduction of the risk of asthma attacks is a major goal of clinical management.
Objective To develop a risk scale to predict asthma attacks based on the blood eosinophil count and exhaled nitric oxide.
Methods Trial-level data were extracted from the Novel START, CAPTAIN, Benralizumab phase 2b, PATHWAY, STRATOS 1-2, QUEST and DREAM trials. Attack rates for control arm patients (n=3051) were stratified by blood eosinophils and exhaled nitric oxide. Aggregate frequency-weighted biomarker-stratified rate ratios were calculated and applied to reference GINA treatment step attack rates derived from 222,817 patients. Other parameters included were a recent asthma attack history (≤1 year), ≥2 concurrent clinical risk factors*, and treatment step. We validated the scale by comparing the frequency-weighted predicted versus observed biomarker-stratified asthma attack rates in the derivation trials.
Results Biomarker-stratified asthma attack rate ratios were 0.65 in the lowest type 2 biomarker combination group and 2.29 in the highest. A previous asthma attack and/or having concurrent risk factors independently increased rates 2.8- and/or 1.3-fold, respectively. Predicted annual attack rates ranged from 0.06 in the lowest biomarker step 1&2 patients to 2.6 in the highest biomarker step 5 patients. The resultant scale is shown in figure 1. There was close agreement between frequency-weighted observed and predicted asthma attack rates: the intraclass correlation coefficient [95%CI] was 0.83 [0.78–0.86], the weighted least squares regression equation was y=0.94x - 0.08 (slope [0.92–0.96], constant [-0.09– -0.07]) with R^2 = 0.79, and the Bland-Altman fixed bias estimate was -0.08 [-0.58–0.41],
Conclusion A prototype scale based on biomarkers of type 2 inflammation shows feasibility and potential to predict asthma attacks which may be prevented by treatment.

Please refer to page A188 for declarations of interest related to this abstract.

S3 EMERGENCY ROOM VISITS AND RESCUE MEDICATION USE IN PATIENTS WITH ASTHMA IN THE IRIDIUM STUDY AND THEIR IMPACT ON CARBON FOOTPRINT

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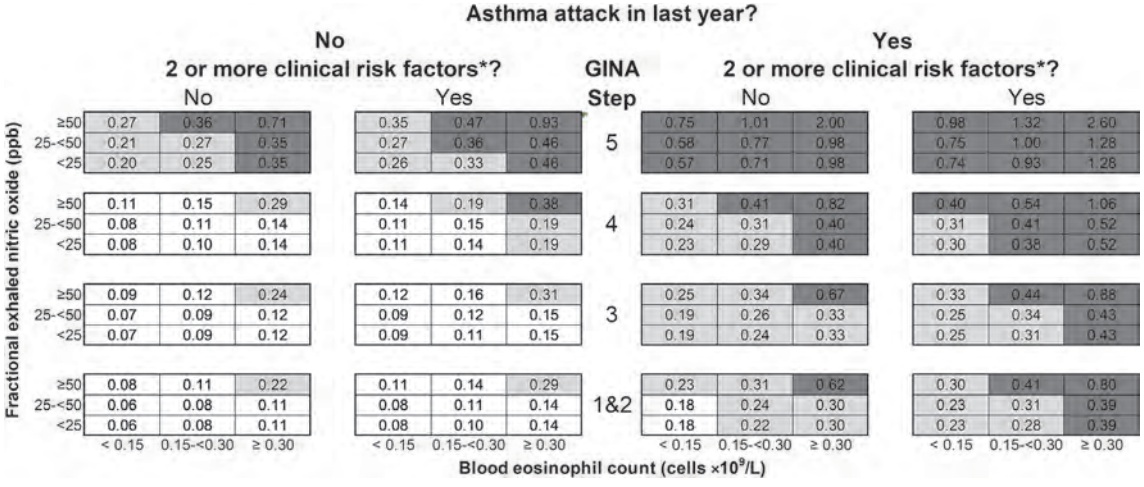
10.1136/thorax-2021-BTSabstracts.9

Introduction/Rationale Patients with uncontrolled asthma experience severe exacerbations that may require emergency room (ER) visits associated with substantial CO_2 emissions. Metered-dose inhalers (MDIs) that deliver rescue medications contain greenhouse gases with a substantial carbon footprint. We analyzed the effect of once-daily indacaterol/glycopyrronium/mometasone furoate (IND/GLY/MF) versus twice-daily salmeterol/fluticasone (SAL/FLU) on ER/hospital visits and rescue medication use in the IRIDIUM[1] study, and its impact on carbon footprint.
Methods Patients who received either IND/GLY/MF high-dose (150/50/160 µg) or IND/GLY/MF medium-dose (150/50/80 µg) via Breezhaler® or SAL/FLU high-dose (50/500 µg) via Diskus® for 52 weeks were included. Patients used salbutamol 100 µg/albuterol 90 µg MDI as a rescue medication. The



Abstract S2 Figure 1 Prototype Oxford asthma attack risk ScaLE (ORACLE). Numbers in each cell are predicted annual asthma attack rates for patients over the age of 12 if treatment is not changed. Blood eosinophil count is contemporaneous or the highest result in last 12 months; exhaled nitric oxide level is contemporaneous. *Risk factors are defined by GINA: poor symptom control, low lung function, non-adherence, reliever over-use, previous intubation/critical asthma attack, selected comorbidities, environmental exposures.

CO_2 emission was calculated using CO_2 emission factor 13.8 kg/visit for ER/hospital visits[2] and CO_2 emission factor 140 g/puff for rescue medication use.

Results 1,842 patients were assessed for ER/hospital visits and 1,800 patients for rescue medication use. IND/GLY/MF high- and medium-dose suggested reductions in ER/hospital visits (rate ratio [RR] 0.66, 0.43 to 1.01 and RR, 0.87, 0.57 to 1.33) versus SAL/FLU high-dose, which would corresponds to a change of 9.1 (5.9 to 13.9) and 12.0 (7.9 to 18.4) kg CO_2 emission per visit, respectively. The difference in mean daily puffs of rescue medication with IND/GLY/MF high- and medium-dose versus SAL/FLU high-dose, was −0.12 (−0.27 to 0.03) and −0.06 (−0.20 to 0.09), respectively, which corresponds to a change of 6.1 (−13.8 to 1.5) and 3.1 (−10.2 to 4.6) kg CO_2 emission per year, respectively.

Conclusions All three-treatment arms of the study significantly reduced CO_2 emissions compared with MDIs. However, indacaterol/glycopyrronium/mometasone furoate resulted in numerical reductions of ER/hospital visits, which suggests increased CO_2 savings versus salmeterol/fluticasone. These results should be cautiously interpreted as our calculations are based on a limited number of variables that affect the carbon footprint. Nonetheless, these results might be used as a basis for conducting studies on carbon footprint in patients with asthma.

The study was funded by Novartis Pharmaceuticals, East Hanover.

REFERENCES

1. Kerstjens HAM, *et al*. *Lancet Respir Med*. 2020;**8**:1000–12.
2. Penny T, *et al*. Coalition for Sustainable Pharmaceuticals and Medical Devices (CSPM) 2015.

Please refer to page A188 for declarations of interest related to this abstract.

S4 ASTHMA IN THE EMERGENCY DEPARTMENT. OUTCOME FROM SPECIALIST NURSE INTERVENTION

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10.1136/thorax-2021-BTSabstracts.10

In an attempt to improve asthma care of patients attending the Emergency Department (ED) we offer Specialist Asthma Nurse intervention post ED attendance. Between October 2018 and March 2019, nurse led appointments were offered to 116 asthmatic who had recently attended ED. Fifty seven attended this appointment, these patients underwent spirometry, FENO, inhaler technique and compliance checks. Treatment was stepped up if asthma control was deemed poor and further nurse led follow up arranged if needed.

We compared ED attendances between these 57 and the 59 who did not attend over the next 18 months. Those that had the intervention had fewer ED visits 8 versus 47, less steroid use 20 versus 28,, better compliance 41/57 versus 25/59, Chi 2 <0.05. They were also more likely to receive a personalised care plan 49/57 v 0/59.

The group who did not attend had 37 attendances in the 18 months before the intervention and 47 in the 18 months post intervention compared to 31 before and 8 after intervention in the group who did attend the nurse led appointment.

Although the 2 groups were not controlled or randomised these results do show improved management and suggest improved outcomes. The decrease in ED attendances was more marked than the decrease in courses of Prednisolone. This may reflect that those following action plans were taking steroids appropriately and so avoiding admission. It also suggests that not all asthmatics attending ED are given Prednisolone. The problem of dealing with the group who failed to attend remains.

S5 MORTALITY ANALYSES ON SYSTEMIC CORTICOSTEROID USE: A LONG-TERM OBSERVATIONAL STUDY

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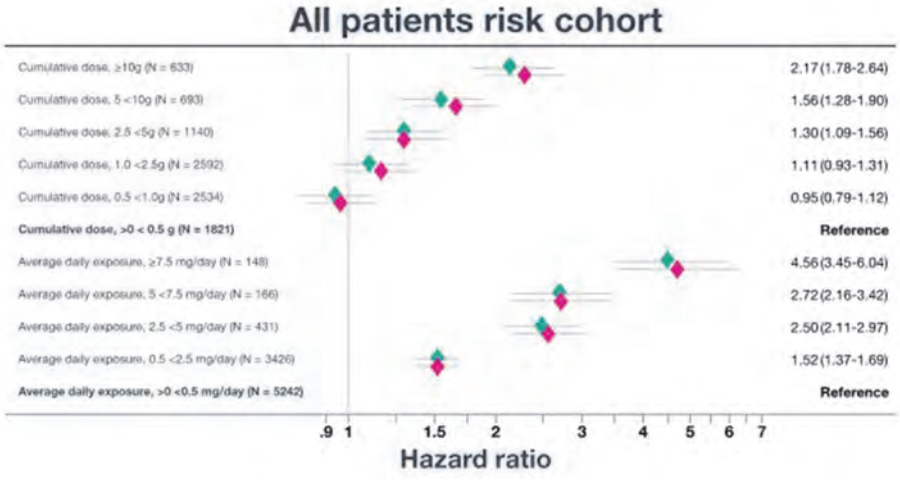
10.1136/thorax-2021-BTSabstracts.11

Introduction and Objective Exposure to systemic corticosteroids (SCS) is associated with higher risks of adverse outcomes, higher healthcare resource utilization, and associated costs in patients with asthma. There is limited information about the relationship between SCS exposure and mortality. The objective of this analysis was to evaluate the association between SCS exposure and mortality among patients with asthma in the United Kingdom.



Abstract S5 Figure 1 Association of cumulative SCS dose and average SCS daily exposure with risk of death among patients with asthma (N=9413)

Methods In this retrospective open cohort analysis of the Clinical Practice Research Datalink (CPRD) database from 1979–2019, patients with asthma (≥18 years of age) were followed from the first recorded prescription of SCS until occurrence of death or end of follow-up. Mortality data was collected through linkage with death registration data from the Office of National Statistics. A time-to-event design with multivariable Cox proportional hazard models adjusting for confounders was used to assess the association between measures of SCS exposure (average daily exposure and cumulative dose) and overall and cause-specific deaths. Hazard ratios (HRs) were calculated for overall and each key adverse outcome-related mortality.

Results Of 9,413 patients with asthma with SCS exposure who were followed for up to 28 years (median 8.7 years), 1,762 died. The most frequent primary cause of death was respiratory disease (30%). The mortality rate was 14–21 per 1000 person-years across SCS-related adverse outcomes of interest with incidence ratios ranging from 1.8 to 2.1. Dose-response relationships of average daily SCS exposure and cumulative SCS with higher risk of death were observed (figure 1). Patients exposed to a cumulative dose ≥10 g of SCS were more than twice as likely to die compared with those with <0.5 g. Patients with an average daily exposure ≥7.5 mg/day were almost 4.6 times more likely to die compared with those with <0.5 mg/day.

Conclusion In patients with asthma, greater cumulative and average daily SCS exposure was associated with increased mortality.

Stay awake! It's an update on sleep

S6 COVID-19 RELATED CHANGES IN OUTPATIENT CPAP SET-UP PATHWAYS FOR OSA ARE LINKED WITH DECREASED 30-DAY CPAP USAGE

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10.1136/thorax-2021-BTSabstracts.12

Introduction The COVID-19 pandemic led to changes in CPAP set-up pathways. Prior to the pandemic, patients received face-to-face (f2f) education, and trialling of CPAP with experienced healthcare professional support. However, trialling CPAP is an aerosol generating procedure and thus became severely limited by infection control guidelines. We aimed to see the impact the necessary practice changes had on CPAP usage.

Methods We conducted a multi-centre retrospective service evaluation of secondary care sleep units. We collected data on consecutive patients commenced on CPAP in July-August 2019 (pre-pandemic) and July-August 2020 (post first-wave). We recorded baseline demographics, sleep study results, CPAP set-up and first follow-up information.

Abstract S6 Table 1 Baseline characteristics from patients. Data are expressed as mean ± standard deviation, median (first quartile, third quartile) or number (percentage), as appropriate

		2019	2020
Age (years)		53.4±13.6	53.4±13.3
Gender	*Female*	206 (33.2%)	185 (32.6%)
	Male	414 (66.8%)	380 (67.0%)
Ethnicity	White	476 (76.8%)	383 (67.5%)
	Asian	18 (2.9%)	12 (2.1%)
	Black	10 (1.6%)	10 (1.8%)
	Other	7 (1.2%)	5 (0.9%)
	Unknown	109 (17.6%)	157 (27.7%)
BMI (kg/m^2)		34.9 (30.6, 41.0)	34.8 (29.5, 40.4)
ESS		11.2±5.5	11.8±5.2
ODI		23.0 (14.1, 43.0)	21.5 (13.0, 41.8)

BMI=body mass index, ESS=Epworth sleepiness score, ODI=oxygen desaturation index ≥4%.

Results In total, we included 1,187 patients from eight centres who were set-up on CPAP, with 620 set-up in 2019, and 567 in 2020. Patient characteristics of the two groups were comparable (*see table 1)*. In 2019, CPAP set-up was f2f, with CPAP machine turned on, in 613 patients (98.9%). By contrast, in 2020, only 6 (1.1%) patients had set-up f2f with CPAP turned on, with 403 (71.1%) set-up f2f without CPAP being turned on, and 158 (27.9%) set-up remotely. Thirty-day CPAP usage fell significantly from a mean ± standard deviation of 4.8±2.6 in 2019 to 3.9±2.7 hours/night in 2020 (mean effect –0.9 hours/night, 95% Confidence Interval (CI) –1.2 to -0.5, p<0.0001). This effect was similar following multivariable adjustments for age, mode of CPAP set-up (f2f or remote), sex, baseline Epworth Sleepiness Scale (ESS), log Oxygen Desaturation Index 4% (ODI) and centre (-0.6 hours/night, 95% CI -1.2 to -0.3, p=0.0006). CPAP usage was lower with both f2f and remote set-up in 2020, compared with 2019. However, in 2020, CPAP usage was also worse with remote set-up compared to f2f set-up (mean effect –0.6 hours/night, 95% CI –1.1 to -0.1, p=0.03).

Discussion Pathway changes that include set-up without trialling CPAP f2f, particularly remote set-up, were associated with clinically relevant reductions in CPAP usage at 30 days. Changes in practice to reduce risk of infection to patients and staff during CPAP set-up were necessary, but should not be accepted as being equivalent to traditional evidenced-based methods of CPAP set-up.

S7 ESTIMATING THE POTENTIAL IMPACT OF RESIDUAL EDS ON THE QOL OF PATIENTS WITH OSA AND, FOR THE FIRST TIME, THEIR PARTNERS, USING A TIME TRADE-OFF METHODOLOGY

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10.1136/thorax-2021-BTSabstracts.13

Introduction and Objectives Excessive daytime sleepiness (EDS) is a common symptom of obstructive sleep apnoea (OSA), persisting in 9% to 22% of patients despite primary airway therapy (residual EDS). EDS can impair work productivity and driving ability, and negatively impact quality of life (QoL) of patients and their partners.

Abstract S7 Table 1 Utility values for patient and partner health states (N=104)[a]

		Utility Values[b]	
		Mean	SD
Patient health states	1. No EDS	0.93	0.11
	2. Mild EDS	0.79	0.17
	3. Moderate EDS	0.61	0.22
	4. Severe EDS	0.55	0.24
Partner health states	5. No EDS	0.95	0.08
	6. Mild EDS	0.88	0.13
	7. Moderate EDS	0.75	0.23
	8. Severe EDS	0.67	0.26

EDS, excessive daytime sleepiness; SD, standard deviation.
[a]All values rounded to 2 decimal places.
[b]Based on a scale of 0–1, where 0 represents QoL equivalent to death and 1 represents the highest QoL.

This study aimed to elicit QoL values (utilities) from a societal perspective for patients with OSA with residual EDS of varying severity and, for the first time, for the partners of these patients, using a novel time trade-off (TTO) approach.
Methods Utility values for health states of varying severities of residual EDS in OSA were elicited using the TTO method in a study conducted with a United Kingdom general public sample (N=110). Four EDS severity health state descriptions were developed from both patient and partner perspectives (no EDS, mild EDS, moderate EDS, severe EDS). During face-to-face interviews, participants were asked to 'trade off' time for each EDS health state for a shorter period in full health (0–10 years), first for the patient health states and then for the partner health states. TTO responses were converted to utility values (scale of 0–1, where 0 represents QoL equivalent to death and 1 represents the highest QoL).
Results Mean utility scores declined with increasing EDS severity (table 1). In the context of the TTO exercise, participants were prepared to trade a mean of 4.5 life-years (out of a maximum of 10) to avoid the QoL consequences of severe EDS compared with best imaginable health and 3.3 life-years to avoid the QoL impact associated with being the partner of a patient with severe EDS.
Conclusions These results demonstrate the high potential impact of residual EDS on the QoL of patients with OSA and their partners. Estimated utility values for patients and partners declined with increased EDS severity. This is the first time that the impact of residual EDS in OSA on QoL and utility has been measured from the partner perspective, highlighting the range of potential benefits that could result from the use of novel treatment options (alongside primary airway therapy) for residual EDS.

Please refer to page A188 for declarations of interest related to this abstract.

S8 THE IMPACT OF ARTEFACT-FREE RECORDING TIME ON THE DIAGNOSIS OF SLEEP DISORDERED BREATHING

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10.1136/thorax-2021-BTSabstracts.14

Background Sleep disordered breathing (SDB) is an umbrella term encompassing obstructive and central sleep apnoea. Overnight studies are used to confirm the diagnosis, however the minimum amount of artefact-free recording time (AFRT) required is yet to be determined in children.
Aim To determine the impact of different lengths of AFRT on the diagnosis of SDB.
Background Patients attended for either overnight cardiorespiratory polygraphy or polysomnography, alongside pulse oximetry sleep studies. Respiratory parameter reports were generated using the first 4, 5, 6 and 7 hours of AFRT. Clinically relevant cut-off (CRCO) values were used in conjunction with common diagnostic parameters: Obstructive AHI (OAHI; $CRCO^{3}2$); Central Apnoea-Hypopnoea Index (CAHI; $CRCO^{3}5$); 3% Oxygen Desaturation Index (ODI3%; $CRCO^{3}6$); 4% Oxygen Desaturation Index (ODI4%; $CRCO^{3}4$). Studies that effectively had diagnostic changes across different AFRTs, where diagnostic parameter values fluctuated above and below the CRCOs, were noted as 'Cases of Change' (COC). Receiver operating characteristic (ROC) curves determined ranges of parameter values at 4 hours to predict the presence of COC across the subsequent AFRTs.
Results 137 children (0.39–17.98 years) were consecutively recruited. The OAHI, CAHI, ODI3% and ODI4% had means of 1.54 (σ=2.66), 1.56 (σ=3.43), 5.21 (σ=6.53) and 2.77 (σ=4.42) respectively. Where children achieved 7 hours of AFRT, COC at 4 to 7 hours were seen as follows: $OAHI^{3}2$ =9.7% (10/103); $CAHI^{3}5$ =2.9% (3/103); $ODI3\%^{3}6$ =3.7% (4/109); $ODI4\%^{3}4$ =1.8% (2/109). For the $OAHI^{3}2$, optimal points on ROC curves demonstrated a range with a lower limit of 0.875 (AUC= 0.733; 50% sensitivity; 93% specificity) and an upper limit of 3.125 (AUC= 0.968; 100% sensitivity; 81% specificity).
Conclusion Studies with 4 hours AFRT are likely to yield diagnostic results in at least 90% of cases when commonly used cut-off criteria are applied. This study has identified ranges at 4 hours within which diagnostic change is most likely with longer periods of AFRT. Consideration should be given to repeating short studies where values at 4 hours lie within these ranges.

S9 THE MANAGEMENT OF SLEEP DISORDERED BREATHING IN PEOPLE LIVING WITH HIV

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10.1136/thorax-2021-BTSabstracts.15

Background Obstructive sleep apnoea (OSA) affects up to 24% of the general population and is associated with increased cardiovascular disease, cognitive impairment and depression. Continuous positive airway pressure (CPAP) is recommended for moderate-severe OSA although poor adherence affects treatment outcomes. We sought to identify OSA prevalence in people living with HIV (PLWH) and evaluate patient reported outcomes in those requiring CPAP.
Methods This observational study was conducted in an adult outpatient HIV clinic. We investigated through validated questionnaires and home sleep studies, OSA prevalence in PLWH reporting excessive daytime sleepiness (EDS), defined by an Epworth score >10. We evaluated symptom burden and CPAP outcomes.

Abstract S9 Table 1 Demographics, baseline characteristics and summary of symptoms in PLWH reporting daytime somnolence with and without OSA

	Somnolent PLWH + no evidence of OSA (AHI < 5)	Somnolent PLWH + evidence of OSA (AHI ≥ 5)	P value
N	**26**	**28**	
Age (years) Mean ± SD	53.5 ± 10.6	53.4 ± 10.8	0.97
BMI (kg/m^2) (Median IQR range)	24 (22.7 – 27.1)	29 (24.7 – 31.2)	**0.019**
Gender (male) (%)	22/26 (85)	25/28 (89)	0.46
Current CD4 count	617 (233)	559 (372)	1.0
Median (IQR range)			
Antiretroviral therapy thought to contribute to insomnia (%)	7/28	9/28	0.258
Smoking status – Ex or current smokers (%)	17/26 (65)	15/28 (54)	0.42
Use of recreational drugs (%)	8/25 (32)	6/27 (22)	0.54
Pittsburgh Sleep Quality Index (scored 0 - 21)	10 (8)	10.5 (9)	0.92
Median (IQR range)			
Fatigue Severity Scale (scored 9 - 63)	46 (20)	39 (28)	0.35
Median (IQR range)			
Generalised Anxiety Disorder – 7 (scored 0 - 21)	11 (13)	6.5 (9)	0.16
Median (IQR range)			
Patient Health Questionnaire- 9 Depression Score (Scored 0 - 27)	14 (12)	10 (9)	0.50
Median (IQR range)			
Standardised EuroQOL 5D-5L	0.691 (0.270)	0.715 (0.451)	0.92
Median (IQR range)			

Results Between May 2018 - Nov 2019, we recruited 314 participants. 23.2% (n=73) reported EDS with significantly higher insomnia, fatigue, anxiety, depression scores and lower quality of life (p <0.0001 for all variables compared to PLWH without EDS).

54/73 (73%) agreed to screening with a home sleep study; 52% (n=28/54) had sleep apnoea; moderate-severe in 57% (16/28). Patients with confirmed OSA had higher BMI (29 vs. 24 kg/m^2; p = 0.019) but no differences in symptom burden, compared to those without OSA (table 1).

31% (n=5) did not start or tolerate initial treatment. Of those using CPAP (n=11), mean six week compliance was 6.22 ± 2.16 hours. Post-treatment AHI was 5.8/hr ± 5.13, significantly improved from baseline (37.8 ±22.48; mean difference -31.98 (CI -46.5 to -17.45), p=0.001). Mean 6 week Epworth score improved to 8.8 ± 5.4 from 15.8 ± 3.96; mean difference -7 (CI -12.1 to -1.9, p = 0.014). By 3 months; further increase of 0.2 hours compliance (CI -1.1 to 1.5, p = 0.739) was seen.

Conclusion There is unmet need in diagnosing and managing OSA in PLWH. Despite patients' significant symptom burden, barriers exist with engagement towards specialist care. Given that we demonstrate improved EDS in PLWH persevering with treatment, we need to find better approaches to support willingness towards investigation, treatment uptake for sleep disordered breathing and overall health management.

REFERENCE

1. Jaffer A, *et al*. Investigating excessive daytime sleepiness in adults living with HIV in the UK. *Thorax*. 2018:**73**(4).

S10 AHI DOES NOT ADEQUATELY REFLECT OSA SEVERITY

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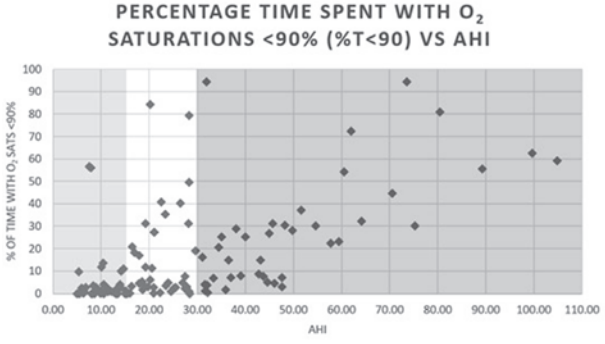
10.1136/thorax-2021-BTSabstracts.16

Introduction Obstructive sleep apnoea (OSA) affects an estimated 1.5 million adults in the UK,[1] resulting in significant cardiovascular consequences. Level of hypoxia and degree of sympathetic activation are postulated to play a role.

The Apnoea Hypopnoea Index (AHI) is used as a tool to assess severity of OSA. AHI counts the number of apnoeas and hypopnoeas per hour. It does not measure depth or duration of hypoxia and may underestimate the risk of complications. The aim of this study was to evaluate the relationship between AHI and the burden of hypoxia.

Method This was a retrospective study, using data from noxturnal sleep studies. Equal numbers of each OSA severity, defined by AHI, were selected consecutively from 122 adult patients who underwent sleep studies between Dec 2020 and May 2021. Demographic data, AHI and percentage time spent with oxygen saturations <90% (% T<90%) were recorded. Excel was used for analysis and Spearman's rank used to calculate the correlation coefficient (rho, r).



Abstract S10 Figure 1 Percentage time spent with O_2 saturations <90% (%T<90) vs AHI

Result AHI was compared to%T<90% (figure 1) showing a moderate positive correlation (r0.6). Subgroup analysis demonstrated a moderate correlation in the severe group (r0.67), whereas only a very weak correlation in the moderate and mild groups (r0.19 and 0.16 respectively). There was no significant difference in the%T<90% in the moderate group compared to those with an AHI 30–60 (mean (SD) 14.86 (20.15) and 17.96(17.91) P=0.067) despite these patients having different categories of OSA severity.

Conclusion This study suggests that AHI inadequately reflects degree of hypoxic burden, and therefore is an incomplete measure of OSA disease severity. The results demonstrate patients with moderate OSA have a burden of hypoxia similar to many of those with severe disease. In these patients, AHI may inadequately reflect the risk of future complications resulting from hypoxia. Further research is needed to develop an alternate measure of severity to accurately reflect this risk, a composite of AHI and hypoxic burden would be a first step.

REFERENCE

1. British Lung Foundation, 2014. Obstructive Sleep Apnoea Health Economics Report. Available at blf.org.uk [accessed 22 June 2021]

Probing the pleural space

S11 METABOLOMIC ASSESSMENT OF PLEURAL EFFUSIONS (MAPLE)

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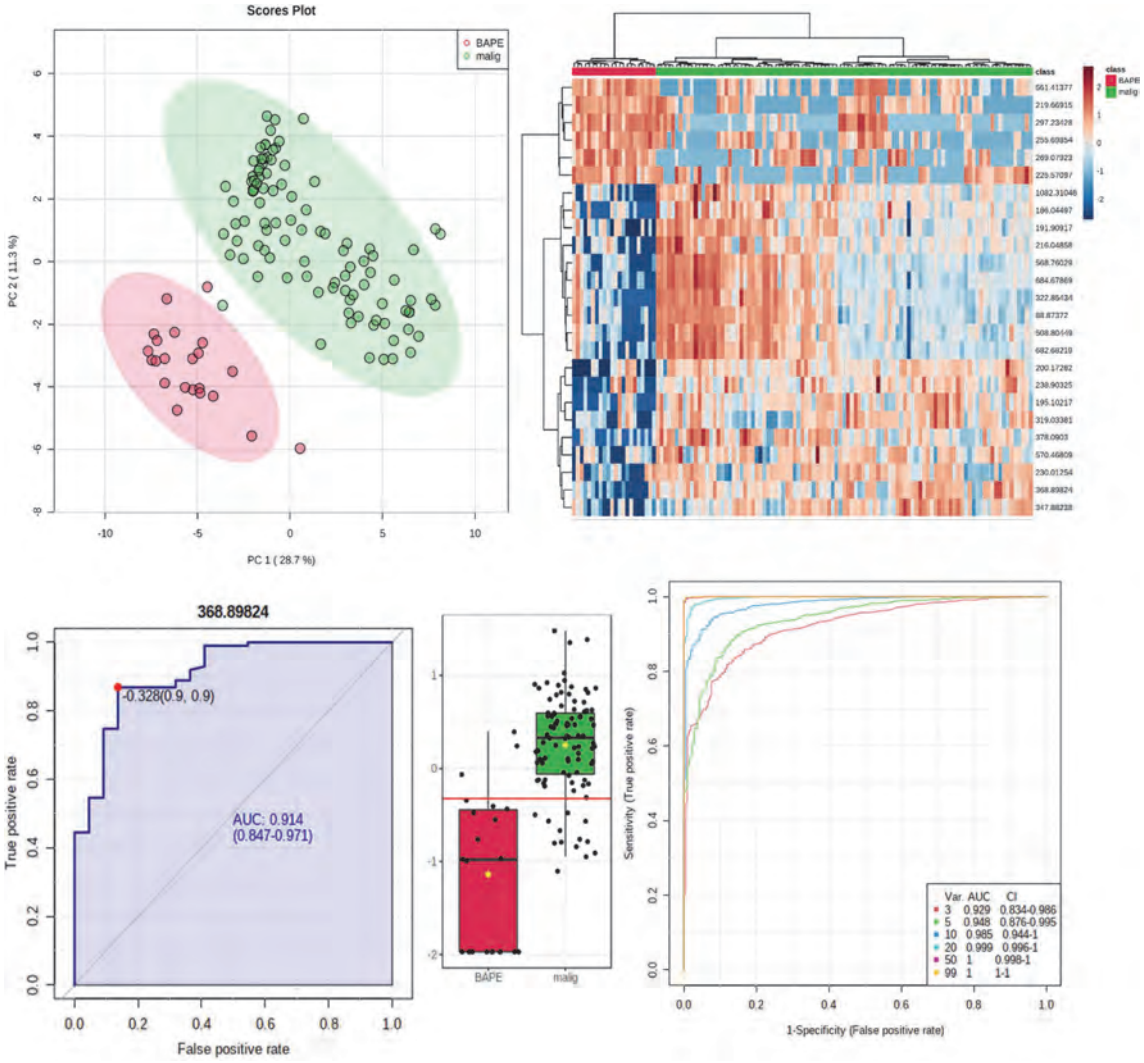
10.1136/thorax-2021-BTSabstracts.17

Introduction Literature reports of pleural fluid analysis can be found from the late 19th century onwards. Yet, despite nearly 150 years of practice, pleural fluid analytic tests remain



Abstract S11 Figure 1 A - Principal Component Analysis (PCA) shows PC1 and 2 explaining 28.7% and 11.3% of the variance, respectively. Ellipses represent 95% CI for each sample class; B - Hierarchical Cluster Analysis (HCA) of the top 25 features, using a Euclidean distance model, shows clear clustering of benign asbestos pleural effusions (BAPE) and separation from malignant pleural effusions (malig); C – Receiver operator Curve (ROC) and box and whisker plot of the feature '368.898' (2-benzyl-3-iodopropanoic acid) with an AUC of 0.914 (CI 0.847–0.971); D – Multivariate ROC analysis showing 6 models from 3 to 99 features. Model 1 includes 3 features achieving an AUC of 0.929 (CI 0.834–0.986)

relatively limited in diagnostic accuracy, leading to requirements for further investigations and uncertainty for physician and patient.

Metabolomics combines high-resolution mass spectrometry and multivariate statistical analysis, characterising thousands of compounds within a biological sample. It is ideal for biomarker discovery and elucidation of underlying disease processes, yet few studies have applied metabolomic approaches to pleural disease. However, recent pilot work has demonstrated distinct metabolomic 'features' between malignant and non-malignant pleural effusions.

Methods 121 pleural fluid samples from a repository held at North Bristol NHS Trust underwent metabolomic analysis using flow-infusion electrospray-mass spectroscopy (FIE-MS) at the Institute of Biological, Environmental and Rural Sciences (IBERS) at Aberystwyth University. The pathologies were: mesothelioma, malignancy (all subtypes), and benign asbestos related pleural effusion (BAPE). The resultant data were analysed using the online platform Metaboanalysis 4.0. Partial Least Squares Discriminant Analysis (PLSDA) was used for feature selection based on our criteria of Variable Importance Projections (VIP) greater than 2. Data were then sub selected using these features, and analysed using Principal Component Analysis and Hierarchical Cluster Analysis (HCA). Biomarker potentials of these chosen metabolites were then assessed using AUC-ROC curves.

Results Of 108 identified features, 15 were able to differentiate BAPE from malignant effusions with AUCs of >0.81. The most discriminatory feature, 2-benzyl-3-iodopropanoic acid, a metabolite of uncertain clinical significance found more abundantly in malignant effusions than BAPE, was able to distinguish malignant pleural effusions from BAPE with an accuracy of 91%. When combined with up to 10 other features in a panel of markers, this diagnostic accuracy increases to 98%.

Conclusions We have identified many promising metabolomic features which demonstrate high accuracies in differentiating malignant effusions and BAPE. These features have the potential to be developed into future clinical diagnostic biomarkers of pleural disease, and may further our understanding of the disease processes leading to pleural effusion formation. Validation of these findings and identification of the specific metabolites is underway.

S12 PAI-1 IS THE PREDOMINANT BIOLOGICAL FACTOR ASSOCIATED WITH SEPTATION FORMATION IN PLEURAL INFECTION

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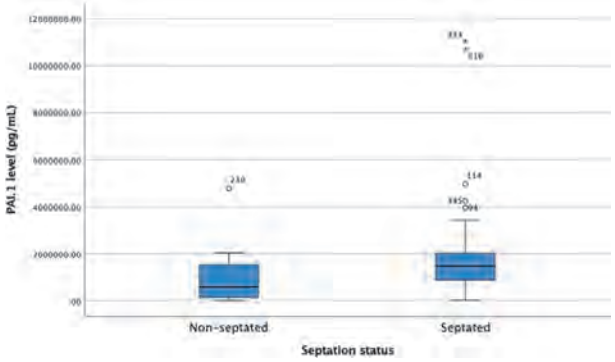
10.1136/thorax-2021-BTSabstracts.18

Introduction Plasminogen Activator Inhibitor-1 (PAI-1) plays an essential role in the pathogenesis of lung and pleural injury. PAI-1 levels in pleural infection have been shown to be significantly elevated compared to malignant pleural effusions and heart failure. A significant variation was seen in levels of PAI-1 protein and activity in the pleural fluid from participants with pleural infection recruited to the MIST-2 study. Rabbit models of pleural injury have demonstrated that, along with other pro-inflammatory cytokines, PAI-1 is an important contributor to impaired fibrin clearance and subsequent pleural loculation. To date, this has not been studied in the context of prospectively collected pleural fluid samples from patients with confirmed pleural infection and documented baseline ultrasound septation status.

Methods Pleural fluid samples (n=214) prospectively collected from patients recruited to the Pleural Infection Longitudinal OuTcomes study (PILOT) were analysed. Protein measurement assays were performed using a commercial Luminex assay for Serpin E1/PAI-1 (Luminex high performance assay, R&D) as analyte of interest in addition to TNF-alpha, MCP-1/CCL-2, IFN-gamma, urokinase plasminogen activator (uPA) and D-dimer. The independent samples T-test was used to compare mean values for each protein between two groups (septated vs non-septated). A multinomial regression model was performed to assess the independent predictive ability for each protein to septation status as an outcome.

Results Complete ultrasound data was available for 166 cases, and these were used in the final analysis. There was a significant difference in the PAI-1 levels between the septated group (n=122; mean=1790.59 ng/mL, SD=2027.28) and non-septated group (n=44; mean=948.82ng/mL, SD=911.41); t(166)=2.65, p=0.009 (Normal ref 2–46 ng/mL). In the multinomial regression model, PAI-1 was the only significant independent predictor of septation status (ß=0.000, p=0.003).



Abstract S12 Figure 1

Conclusion These data confirm that whilst several biological factors may contribute to impaired fibrinolysis and subsequent septation formation in pleural infection, PAI-1 appears to be the most important. These data imply that PAI-1 is likely to be the most useful target for further studies involving intrapleural fibrinolytic therapy in pleural infection. Further work assessing the effect of baseline PAI-1 levels on clinical outcomes in this dataset is ongoing.

S13 ANTIBIOTIC PENETRATION INTO THE INFECTED PLEURAL SPACE; A PK/PD STUDY

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10.1136/thorax-2021-BTSabstracts.19

Introduction and Objectives Pleural infection is a serious clinical condition with an average hospital length of stay of 13 days. Current standard of care defaults to hospital admission for drainage of the infected fluid and intravenous antibiotics. The standard empirical antibiotic choice varies nationally but the ability of these antibiotics to reach the pleura is poorly understood. Previous pharmacokinetics and pharmacodynamics (PK/PD) literature on the penetrance of antibiotics into pleural fluid is extrapolated from non-infected effusions (e.g. malignant effusions) or animal models.

The Pleural Antibiotic Concentrations informing Treatment (PACT) study is a single centre PK/PD study that aims to assess the concentration of antibiotics within the infected pleural space to improve the evidence base around antimicrobial choice, route and duration of therapy.

Methods Patients with parapneumonic effusions/empyema planned for pleural drainage were prospectively recruited. Serial pleural fluid samples were collected timed with routine antibiotic administration and paired with synchronous serum sampling. Pleural fluid and serum antibiotic concentrations were measured using a validated high performance liquid chromatography (HPLC) method at the National Antimicrobial Reference Laboratory (Bristol UK).

Results This study is ongoing, further results on a wider range of antimicrobials will be available for the conference.

At the time of writing, 18 patients had been recruited (15 CPPE, 3 empyema) with over 150 paired serum/fluid samples collected. Ten different antibiotics have been assayed although the majority of timepoints relate to Amoxicillin/Co-amoxiclav (n=36), Metronidazole (n=28) and Piperacillin-Tazobactam (n=22) at this time, see figure 1.

For these antibiotics the peak concentration and area under the curve within the pleural space was equivalent to serum levels. Importantly, across the dosing schedule the pleural antibiotic levels never fell below the minimum inhibitory concentrations (MICs) for bacteria known to cause pleural infection even when given orally. The pleural levels for penicillins persisted beyond the dosing schedule (8 hours) and were not affected by pleural pH or fibrinolytics.

Conclusions For 3 commonly used antibiotics (Amoxicillin, Metronidazole, Piperacillin-Tazobactam) the pleural fluid concentration of antibiotic remined well above the usual MICs of causative bacteria. Penetrance and persistence of antibiotics make twice-daily or oral administration a possibility in pleural infection.

S14 LENGTH OF ANTIBIOTIC COURSE FOR TREATING PLEURAL INFECTION: A RANDOMISED TRIAL

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10.1136/thorax-2021-BTSabstracts.20

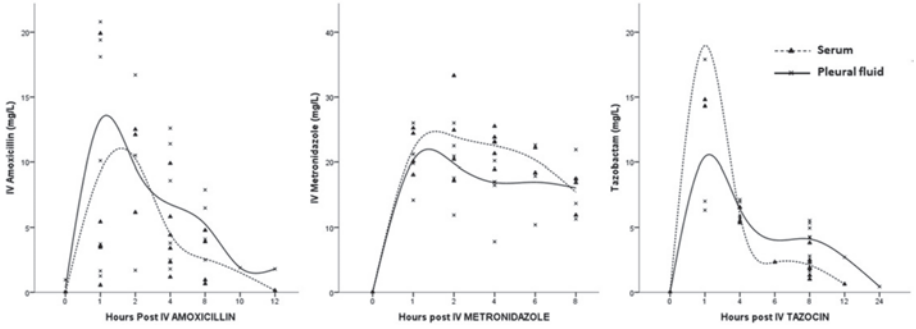
Background Expert opinion recommends treating pleural infection with at least 4 weeks (and up to 6 weeks) of antibiotics and stronger evidence is required to guide management. We aim in this trial to investigate whether shorter durations of antibiotic therapy are as effective as (standard) longer courses.

Methods The short vs long antibiotic course for pleural infection management (SLIM) randomised open-label trial aims to recruit 50 patients with pleural infection randomised 1:1 to receive a short course (total duration of 2–3 weeks, group A) or long course (4–6 weeks, group B) of antibiotics. Patients are included if they are adults hospitalised for pleural infection, at low-moderate risk of mortality (RAPID score 0–4), who have been stabilized and are ready to be shifted to oral therapy within 14 days of admission. The primary endpoint is infection relapse six weeks post admission (defined as worsened pleural collection on imaging with elevation of post-discharge inflammatory markers) in the study groups. Secondary outcomes include length of antibiotic courses and time to return to normal daily activity in study groups. Recruitment to trial is ongoing.

Results Between Oct 2020 and June 2021 thirty-six patients were recruited; 18 patients randomised to each group. Follow up data was available for 17 patients in each group (one loss to follow up and one death before follow-up visit). Table 1 summarises data of study patients. By 6 weeks post admission 3/17 (17.6%) of group A patients and 2/17 (11.7%) of group B patients had relapse of infection (χ^2 0.234, p=0.628). All five relapses occurred while patients were still on antibiotics. After controlling for RAPID score, the adjusted odds ratio of relapse with shorter antibiotic courses was 1.301 (95% CI 0.171 to 9.891, p=0.800).

The mean difference in the length of antibiotic treatment between the 2 groups was 13.2 days (95% CI 10.7 to 15.7 days). 8/13 (62%) of group A and 8/16 (50%) of group B patients reached normal level of activity by six weeks post diagnosis.

Conclusion In adult patients with pleural infection and low-moderate RAPID score who are stabilized within 14 days of



Abstract S13 Figure 1 Amoxicillin, Metronidazole and Tazocin (Tazobactam) levels in serum and pleural fluid post intravenous administration

Abstract S14 Table 1 Demopgraphic and clinical data of study patients. Data are summarised as number (proportion) mean ± standard deviation, or median [inter quartile range]

Variable	Group A	Group B
Age, years	41.3±13.8	49.6±14.2
Sex, female	7/18 (38.9%)	6/18 (33.3%)
RAPID score	2 [1-3.25]	3 [1.75 – 4]
Length of hospital stay, days	10.25±3.32	11.44±2.64
Time to from discharge to return to normal level of activity, days	10 [4.5 – 18] (N= 8)	14.5 [4.5 – 18.5] (n=8)
Infection relapse, n	3/17 ((17.6%)	2/17 (11.7%)

diagnosis, a three-week antibiotic course appears to be sufficient.

Registration NCT04615286

S15 EVOLUTION OF MESOTHELIOMA FOLLOWING INITIAL BIOPSIES SHOWING BENIGN PLEURAL INFLAMMATION: A META-ANALYSIS

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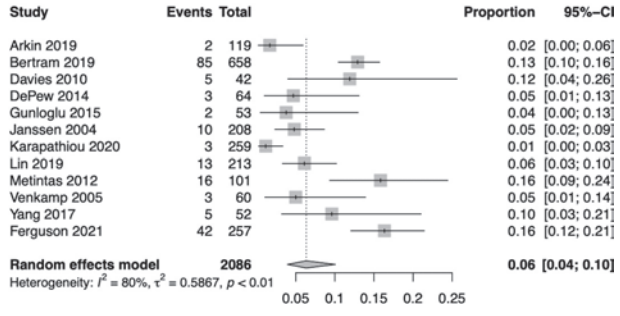
10.1136/thorax-2021-BTSabstracts.21

Introduction Malignant Pleural Mesothelioma (MPM) is typically preceded by chronic pleural inflammation, providing a unique window for translational research. Within the PREDICT-Meso International Accelerator Network, the Meso-ORIGINS (Mesothelioma Observational study of RIsk prediction and Generation of benign-meso tissue pairs, Including a Nested MRI Sub-study) study will recruit 500 asbestos-exposed patients with initial benign pleural biopsies. All will undergo detailed surveillance at ~20 UK sites, including repeat biopsies in the minority who evolve into MPM. These paired tissue samples will be used to define new therapeutic targets and develop new pre-clinical models for drug screening. Here, we integrate data from the 4-centre Meso-ORIGINS feasibility study regarding Benign-MPM evolution rate, with previously published literature. This data is being used to finalise the Meso-ORIGINS study design and site selection.

Methods Studies were identified on PubMed using the search terms 'non-specific pleuritis', 'benign fibrinous pleurisy' and 'mesothelioma'. The following data were extracted: publication year, number of benign pleuritis cases, number of subsequent evolutions, cohort entry criteria (including biopsy technique, asbestos exposure), median follow-up, country and region of origin, and study design (retrospective or prospective). A random effects meta-analysis model was used to analyse the primary outcome; MPM evolution rate, with I^2 used to assess between-study heterogeneity.



Abstract S15 Figure 1

Results 11 studies were identified. These data were combined with Meso-ORIGINS feasibility study data (42 evolutions from 257 benign cases (16%)),[1] generating a total of 189 evolutions from 2086 benign cases. The summary point estimate of MPM evolution was 6% (95% CI 4–10), see figure 1, which also confirms significant between study heterogeneity ($I^2$80%, p<0.01).

Conclusion The Benign-MPM evolution rate varies in the reported studies, which show high inter-study heterogeneity. Sub-group analyses of individual study factors associated with higher MPM evolution rates are ongoing, including biopsy techniques (LAT vs VATS), median follow-up, geographical area in relation to MPM incidence and asbestos exposure frequency. These data will inform the site selection process during Meso-ORIGINS set-up.

REFERENCE

1. Ferguson K, Mercer R, King J, *et al*. S43 Preliminary results of the Meso-ORIGINS feasibility study: retrospective element regarding BAPE-mesothelioma evolution rate. *Thorax* 2021;**76**:A28.

Predictive tools for acute deterioration in COVID-19 and beyond

S16 PROGNOSTICATION IN HOSPITAL ACQUIRED PNEUMONIA – ARE CURRENT SCORING SYSTEMS FIT FOR PURPOSE?

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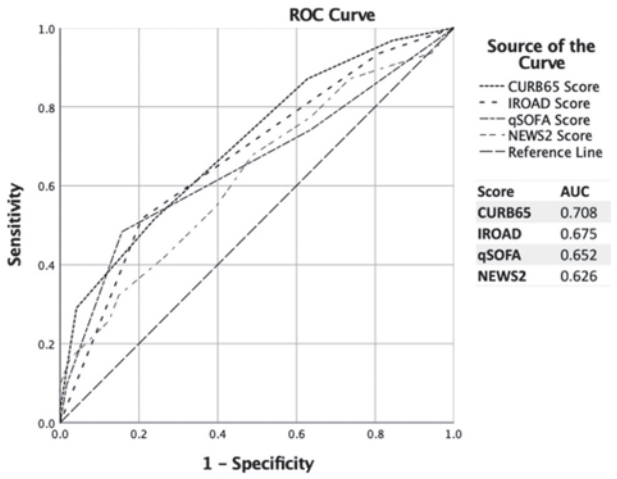
10.1136/thorax-2021-BTSabstracts.22

Introduction Non-ventilator hospital acquired pneumonia (NV-HAP) is the most common nosocomial infection in England. Evidence regarding prognostic factors in NV-HAP patients is limited. No NV-HAP-specific scoring systems that can identify patients at risk of poor outcomes are in widespread use. This study aims to identify factors associated with mortality and assess the accuracy of currently used scoring systems in NV-HAP patients.

Methods Diagnostic criteria for NV-HAP were adapted from the definition described in the 2016 American Thoracic Society/Infectious Diseases Society of America guidelines. Case notes of adult patients admitted to a tertiary hospital between 22nd November 2019–23rd February 2020 with an International Classification of Diseases (ICD)-10 coded diagnosis of NV-HAP were retrospectively screened. For patients that met the diagnostic criteria, clinical variables at the time of HAP diagnosis were recorded and four prognostic scores were calculated. The scoring systems assessed were: CURB65; National Early Warning Score 2 (NEWS2); Quick Sequential Organ Failure Assessment (qSOFA); and the Japanese Respiratory Society Immunodeficiency, Respiration, Orientation, Age, Dehydration (IROAD) score. The association between clinical variables and 30-day mortality was investigated using



Abstract S16 Figure 1 Receiver operating characteristic (ROC) curves and area under the curve (AUC) values for 30-day mortality prediction by CURB65, IROAD, qSOFA and NEWS2 scoring systems

univariate analysis. The accuracy of the scoring systems in predicting 30-day mortality was assessed using receiver operating characteristic (ROC) analysis.

Results We identified 323 patients with an ICD-10 coded diagnosis of NV-HAP. 154/323 (48%) met the diagnostic criteria for inclusion. 30-day mortality in these included patients was 21.4%. Univariate analysis revealed advanced age, emergency admission, speech/swallowing difficulties, altered mental status, lymphocyte count$<0.7x10^9$/L, neutrophil-to-lymphocyte-ratio$\geq$10, urea>7mmol/L, acute kidney injury, CURB65$\geq$2, qSOFA$\geq$2 and IROAD='severe' as being significantly associated with 30-day mortality. Raised white blood cell count, C-reactive protein, the extent of radiographic features, prior antibiotic therapy and NEWS2>4 were not significantly associated with mortality. In ROC analysis, scoring systems achieved the following area under the curve values: CURB65-0.708; IROAD-0.675; qSOFA-0.652 and NEWS2-0.626 (figure 1).

Conclusion NV-HAP-specific scoring systems are needed, as current scoring systems have limited prognostic accuracy. Larger studies with the power to perform multivariate analysis are required to validate the factors identified as being associated with mortality. These factors may be used to create a more accurate, NV-HAP-specific scoring system.

S17 DYNAMIC EARLY WARNING SCORE VERSUS NATIONAL EARLY WARNING SCORE-2 FOR PREDICTING CLINICAL DETERIORATION IN RESPIRATORY PATIENTS

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10.1136/thorax-2021-BTSabstracts.23

Background The National Early Warning Score-2 (NEWS2) is used to detect patient deterioration in UK hospitals but relies on a snapshot assessment. We developed a Dynamic Early Warning Score (DEWS) which takes into account changes over time, and assessed its accuracy in respiratory patients for predicting death or intensive care unit (ICU) admission, both within 24 hours, and clinical deterioration within 4 hours.

Methods Clinical observations data were extracted from electronic data records for 31590 respiratory in-patient episodes (53.5% female, mean age 69.9) at a large acute NHS Trust from 1st April 2015 to 31st December 2020, comprising 1037349 date and time-stamped observation sets. 786 in-patient episodes comprising 52300 observation sets were annotated manually following reference to the medical case-notes. Clinical deterioration was defined as a specific event (eg. hospital-acquired pneumonia) requiring a change in treatment (eg. antibiotics). Development of DEWS used similar methodology to Zhu et al (*Resuscitation*. 2020; 157: 176–84). Continuous variables were divided into two separate variables corresponding to high or low values. Time series features including rolling average, standard deviation and trend over previous observations were entered into a logistic regression model. For death or ICU admission within 24 hours, data from 2015–2019 and 2020 were used for model training and validation respectively. For clinical deterioration within 4 hours, Results presented are for the training dataset (validation dataset is pending).

Results Death or ICU admission occurred within 24 hours of 2.3% of observations sets. The area under the receiver operating curve (AUC [95% confidence interval]) for predicting death or ICU admission within 24 hours was 0.903 (0.897 – 0.911) for DEWS versus 0.862 (0.859 – 0.865) for NEWS2 in the training dataset, and 0.901 (0.892 – 0.908) for DEWS versus 0.854 (0.849 – 0.858) for NEWS2 in the validation dataset. Clinical deterioration occurred within 4 hours of 6.6% of observation sets. The AUC for predicting clinical deterioration within 4 hours was 0.861 (0.842 – 0.878) for DEWS versus 0.793 (0.783 – 0.801) for NEWS2.

Conclusions DEWS has superior performance compared to NEWS2 with respect to predicting death or ICU admission within 24 hours, and clinical deterioration within 4 hours, in respiratory patients.

Please refer to page A188 for declarations of interest related to this abstract.

S18 INVESTIGATING THE IMPACT OF INFLUENZA ACTIVITY ON EXCESS MORTALITY RATES FROM CARDIOVASCULAR, RESPIRATORY AND RENAL DISEASES IN IRELAND DURING THE 2010/11–2019/20 INFLUENZA SEASONS

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10.1136/thorax-2021-BTSabstracts.24

Introduction COVID-19 and influenza infection are associated with cardiovascular, respiratory and renal complications. However, cardiovascular, respiratory and renal disease mortality rates in Ireland decreased by 0.04%, 0.12% and 0.12% respectively in 2020 relative to 2019, despite nearly 100,000 new COVID-19 cases being reported in Ireland in 2020. Government-imposed social distancing measures resulted in abolition of influenza activity (IA). We analysed population data from the 2010/11–2019/20 influenza seasons to estimate the impact of reduced IA on cardiovascular, respiratory and renal disease mortality rates during the COVID-19 pandemic season.

Methods Quarterly mortality data for acute myocardial infarction (AMI), cerebrovascular disease, pneumonia, asthma and renal disease from first quarter (Q1) 2010 to fourth quarter (Q4) 2020 was obtained from the Central Statistics Office.

Weekly data on influenza-like illness (ILI) rates and positive percentages (PP) (i.e., proportion of influenza-positive sentinel respiratory specimens) was obtained from the Health Protection Surveillance Centre. Excess mortality rate during influenza season was defined as the percentage difference between Q4/Q1 and preceding third quarter (Q3) mortality rates. We adopted the Goldstein Index (ILI rate × PP) as an indicator of IA. Time series analyses, Pearson correlation coefficients (r) and linear regression models were used to evaluate the relationships between IA and excess cardiovascular, respiratory and renal disease mortality rates.

Results Statistically significant positive associations were observed between IA and excess AMI (r=0.557, p=0.011), cerebrovascular disease (r=0.858, p<0.001), pneumonia (r=0.635, p=0.003), asthma (r=0.668, p=0.001) and renal disease (r=0.652, p=0.002) mortality rates. Linear regression models predicted 0.072% (95% confidence interval 0.019%, 0.125%), 0.095% (0.067%, 0.123%), 0.184% (0.073%, 0.296%), 0.367% (0.165%, 0.569%) and 0.124% (0.053%, 0.196%) increases in excess AMI, cerebrovascular disease, pneumonia, asthma and renal disease mortality rates respectively per unit increase in IA.

Conclusion Elimination of IA may have contributed towards limiting the effects of COVID-19 on cardiovascular, respiratory and renal disease mortality rates in Ireland.

S19 RELEVANCE OF PREDICTION SCORES DERIVED FROM THE SARS-COV-2 FIRST WAVE, IN THE UK COVID-19 SECOND WAVE, FOR EARLY DISCHARGE, SEVERITY AND MORTALITY: A PREDICT COVID UK PROSPECTIVE OBSERVATIONAL COHORT STUDY

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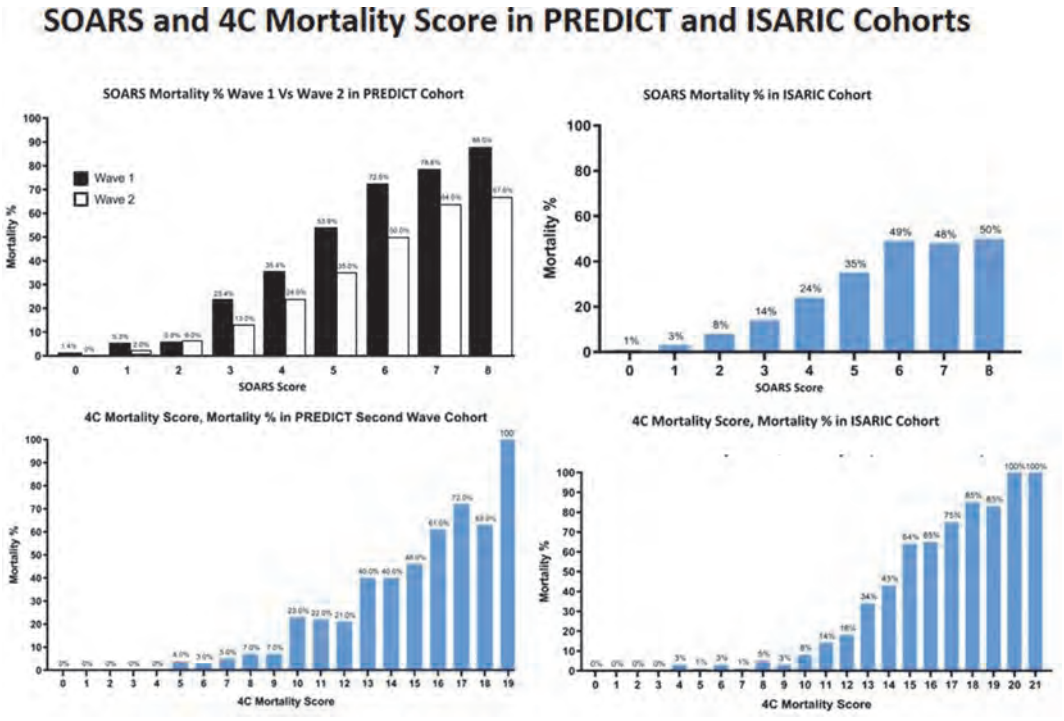
10.1136/thorax-2021-BTSabstracts.25

Introduction and Objective COVID-19 prognostication scores are all based on COVID-19 first wave, requiring prospective validation in the evolving pandemic due to SARS-CoV-2 variants (prevalent B.1.1.7 replacing parent D614) and healthcare responses altering patient demographic and mortality. Accelerated COVID-19 virtual hospital (VH) telemedicine model implementation avoids hospital admission, appropriately allocating hospital resources to pandemic needs in tandem with resumption of regular healthcare services, requires a safe triage tool. Widely used COVID-19 first wave derived prognostication scores, SOARS and 4C Mortality Score, with uncertain performance in the evolving pandemic, raises the need for prospective validation. We prospectively validate SOARS and 4C Mortality Score in the evolving UK COVID-19 second wave determining relevance for mortality and safe early discharge.

Methods Protocol-based, prospective observational cohort study of SOARS and 4C Mortality Score in 1,383 PREDICT (single site) and 20,595 multi-site ISARIC (International Severe Acute Respiratory and Emerging Infections Consortium) patient cohorts during the UK COVID-19 second wave, between October 2020 and January 2021

Results Data from 1,383 patients (median age 67y, IQR 52–82; mortality 24.7%) in the PREDICT and 20,595 patients from the ISARIC (mortality 19.4%) cohorts showed SOARS had AUC of 0.8 and 0.74, while 4C Mortality Score had an AUC of 0.83 and 0.91 for hospital mortality, in the PREDICT and ISARIC cohorts respectively, therefore effective in evaluating both safe discharge and in-hospital mortality. 19.3% (231/1195, PREDICT cohort) and 16.7% (2550/14992, ISARIC cohort) with a SOARS of 0–1 were potential candidates for home discharge to a virtual hospital (VH) model. SOARS score implementation resulted in low re-admission rates, 11.8% (27/229), and low mortality, 0.9% (2/229), in the VH pathway. Use is still suboptimal to prevent admission, as 8.1%



Abstract S19 Figure 1 SOARS and 4C mortality score in PREDICT and ISARIC cohorts

in the PREDICT cohort and 9.5% in the ISARIC cohort were admitted despite SOARS score of 0–1.

Conclusion SOARS and 4C Mortality Score remains valid and relevant to their purpose, transforming complex clinical presentations into tangible numbers, aiding objective decision making, despite evolving viral subtype and treatment advances altering patient demographic and mortality. More importantly both scores are easily implemented within urgent care pathways for safe admission avoidance especially to a VH model.

The new normal? Novel and remote strategies for pulmonary rehabilitation

S20 COMBINING PHYSICAL ACTIVITY BEHAVIOURAL MODIFICATION STRATEGIES ALONGSIDE COGNITIVE BEHAVIOURAL THERAPY DURING PULMONARY REHABILITATION IN PATIENTS WITH COPD: AN INTERIM ANALYSIS OF A PILOT RCT

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10.1136/thorax-2021-BTSabstracts.26

Introduction In patients with COPD, pulmonary rehabilitation (PR) improves exercise capacity, but continues to report inconsistent improvements in physical activity, particularly in those with low baseline physical activity levels. In addition, patients with elevated levels of anxiety and/or depression are typically less able to manage symptoms and improve physical activity.

Objective To determine the efficacy of combining physical activity behavioural modification strategies (PA) with cognitive behavioural therapy (CBT) during PR in improving patients' experiences of physical activity and steps/day in COPD patients with low baseline physical activity levels and high anxiety and/or depression.

Methods In this pilot RCT, 23 patients (mean±SD: FEV_1: 40 ±17%, baseline steps/day: 2913±1821, HADS Anxiety: 11±3, HADS Depression: 11±4) were assigned 1:1 to receive PR +CBT, or PA (comprising motivational interviews, step count monitoring, feedback using a pedometer and goal setting) alongside PR+CBT (PA+PR+CBT). Assessments included patients' experiences of the amount and difficulty of physical activity captured by the Clinical PROactive Physical Activity in COPD (C-PPAC) instrument, accelerometer steps/day, the 6MWT, CAT and HADS questionnaires.

Results We found significant and clinically important improvements in favour of PA+PR+CBT compared to PR+CBT intervention in the C-PPAC total score and steps/day. Meanwhile, similar significant and clinically important improvements in the 6MWT, CAT and HADS depression scores were reported across both groups (table 1).

Conclusions Providing anxious and/or depressed patients with physical activity behavioural modification strategies alongside CBT during PR is more favourable for improving patients' experiences of the amount and difficulty of physical activity and steps/day than providing CBT and PR.

S21 FEASIBILITY OF SMARTPHONE-BASED PHYSICAL ACTIVITY TELE-COACHING IN LUNG TRANSPLANT RECIPIENTS

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10.1136/thorax-2021-BTSabstracts.27

Introduction As the COVID-19 pandemic continues, the demand for tele-medicine remains high, particularly for lung transplant recipients who often live far from transplant centres. This interim analysis presents the early findings from our study investigating the feasibility of a 3-month semi-automated tele-coaching intervention *(Demeyer et al., 2017, Thorax)* in this population.

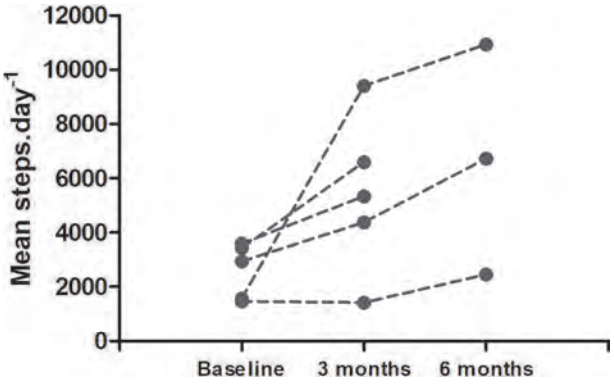
Methods The intervention consists of a pedometer and smartphone app, allowing transmission of activity data to a platform (Linkcare v2.7.1) that provides feedback, activity goals, education, and contact with the researcher as required. Remote assessment pre- and post-intervention includes physical activity (PA) using accelerometry (Actigraph GT3X), HADS, SF-36 questionnaire and patient acceptability by a project-tailored questionnaire.

Results So far, all eligible patients approached were willing to be randomised to the intervention or usual care (n=9; COPD=2, ILD=5; CF=1; PH=1). In the intervention, usage of the pedometer was excellent, with patients wearing it for 6.9±0.1 days per week and rating the pedometer and telephone contact (9±2 out of 10) as the most vital aspects. Patient feedback has been positive, with 80% (4 out of 5) of patients responding that they 'liked' taking part and that the intervention 'helped them a lot' to increase their activity levels. In patients who completed the intervention (n=5), there was an improvement in accelerometry daily steps (by 2830 ±3026), time spent in light (by 26±21 mins) and moderate

Abstract S20 Table 1

	Baseline (PA+PR+CBT)	Post PR (PA+PR+CBT)	Within-group difference	Baseline (PR+CBT)	Post PR (PR+CBT)	Within-group difference	Between-group P values
C-PPAC total	54±14	62±12	8±8 *	58±11	59±12	1±1	0.047
Daily steps	3180±1714	4245±2034	1065±975 *	2632±1877	2745±1933	113±456	0.020
CAT	29±4	24±4	-5±3 *	31±5	29±6	-2±2 *	0.075
6MWT (m)	265±95	324±88	59±44 *	245±84	275±85	30±22 *	0.067
HADS (A)	12±5	9±4	-3±2 *	10±3	9±4	-1±1	0.397
HADS (D)	10±6	8±4	-2±2 *	11±2	8±3	-3±1 *	0.898

*Clinically important improvement



Abstract S21 Figure 1 Daily steps using accelerometry (Actigraph GTX3), at baseline (hospital discharge), 3 months and 6 months for lung transplant recipients assigned to the intervention group (n=5)

(by 7±11 mins) activities, as well as a reduction in sedentary time (by -58±141 mins) at 3 months. At 6 months (n=3), there was a further improvement in daily steps (by 1641 ±661), a reduction in sedentary time (by -28±137 mins) and time spent in light activities (by -21±36 mins), with an increase in moderate activity time (by 25±29 mins). Following the 3-month intervention, increases were shown in physical functioning, role physical, mental health, bodily pain, and general health SF-36 domain scores, but not in HADs.

Conclusion Tele-coaching appears feasible in lung transplant recipients, with patients wearing the pedometer and interacting well with the app over 3 months. This is promising in the current climate, with the need to develop and evaluate innovative ways of supporting patients remotely.

S22 EVALUATION OF A VIRTUAL PULMONARY REHABILITATION PROGRAMME AND COMPARISON TO TRADITIONAL FACE-TO-FACE PROGRAMMES IN COPD

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Introduction and Objectives During the coronavirus disease (COVID-19) pandemic, pulmonary rehabilitation (PR) services in the UK ceased traditional face-to-face (F2F) programmes and transitioned to remote or virtual delivery. Virtual programmes may continue to be offered as an alternative to F2F programmes in order to increase accessibility to PR. Our objective was to compare the benefits of Virtual Pulmonary Rehabilitation (VPR) to F2F programmes in a community PR service in England.

Methods With the support of the local Digital Health team, VPR was delivered in cohort groups using Microsoft Teams, twice-weekly for 6 weeks, supported by a specialist physiotherapist and with education delivered live or via pre-recorded webinars. The F2F cohort programme comprised of twice-weekly exercise and education sessions for 6 weeks. Outcomes of VPR delivery (June 2020-March 2021) were compared to F2F programmes from the same time period 12 months previously using the following measures: Chronic Respiratory Questionnaire (CRQ); Hospital Anxiety and Depression Scale (HADS). Due to restrictions, physical capacity for VPR was measured using sit to stand (STS) tests as opposed to Incremental (ISWT) and Endurance Shuttle Walk Tests (ESWT) for F2F.

Abstract S22 Table 1 Number of patients achieving minimal clinically important differences in CRQ and HADS following Virtual Pulmonary Rehabilitation (VPR) or Face-to-Face pulmonary rehabilitation (VPR)

Outcomes	VPR n (%)	F2F n (%)	p value (Chi-square test)
CRQ-Dyspnoea	32 (54)	30 (55)	0.974
CRQ-Fatigue	30 (50)	34 (62)	0.203
CRQ-Emotion	23 (38)	29 (53)	0.121
CRQ-Mastery	24 (40)	34 (62)	0.019
HADS-Anxiety	17 (33)	24 (44)	0.214
HADS-Depression	12 (23)	27 (50)	0.004

Results VPR (n=60) produced significantly smaller improvements than F2F (n=55) in CRQ-Fatigue (+0.4±1 vs +0.9 ±1.3, p=0.036), CRQ-Mastery (+0.3±1 vs. +0.9±1.2, p=0.005) and HADS-Depression (-0.1±2.7 vs. -1.9±3.1, p=0.003). Improvements in CRQ-Dyspnoea (+0.6±1 vs. +1 ±1.4, p=0.159), CRQ-Emotion (+0.3±1 vs. +0.5±1, p=0.348) and HADS-Anxiety (-0.2±3 vs. -1.4±3.1, p=0.132) with VPR and F2F were not significantly different. A greater proportion with F2F achieved clinically meaningful improvements in CRQ-Mastery and HADS-Depression but no other statistically significant differences were found (table 1). VPR significantly increased 30-sec STS (+1.5 repetitions, p<0.001), but not 1-min STS (+1.7 repetitions, p=0.085). F2F significantly increased ISWT (+33m, p<0.001) and ESWT (+180m, p<0.001).

Conclusions F2F PR provided larger improvements in outcomes and a greater number of COPD patients achieving meaningful improvements in mastery and depression. However, the number of patients achieving clinically meaningful improvements in dyspnoea, fatigue, emotional function and anxiety with VPR demonstrates the success of transitioning to this model during the pandemic and supports the potential use of such alternative delivery models to increase access to PR.

S23 INTEGRATING HOME-BASED EXERCISE TRAINING WITHIN A HOSPITAL AT HOME SERVICE FOR PATIENTS HOSPITALISED WITH ACUTE EXACERBATIONS OF COPD: A MIXED METHODS FEASIBILITY STUDY

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10.1136/thorax-2021-BTSabstracts.29

Background The uptake of face-to-face supervised outpatient-based pulmonary rehabilitation (PR) following hospitalisation for an acute exacerbation of COPD (AECOPD) is low. One commonly cited barrier is travel. Home-based PR may be an alternative setting. The aim of this study was to determine whether a co-designed home-based exercise training intervention, delivered alongside usual hospital at home (HaH) care

post-hospitalisation for an AECOPD, is acceptable and feasible.

Methods A mixed method feasibility study was conducted including a parallel, two-group randomised controlled trial (RCT) (control group: usual HaH care; intervention group: usual care plus home-based exercise training) with convergent qualitative components (interviews: patients, family carers, researchers; focus groups: healthcare professionals [HCPs]).

Results 16/132 patients screened were recruited to the RCT with 8 allocated to each group and one withdrawn prior to receiving HaH care (56% were male, mean [SD] age: 74 [9] years, median [IQR] FEV_1: 29 [21, 40] percent predicted, 87% with an eMRC dyspnoea score of 4, 5a or 5b). Four vs eight and four vs seven attended four week and three-month follow-up assessments in the control and intervention groups respectively. There was no evidence of contamination in the control group. 25% of patients allocated to the intervention group were unable to receive the intervention due to Covid-19. The questionnaire-based outcomes were more complete and appeared more acceptable to patients than physical measures, with very poor uptake for physical activity monitoring via accelerometery. Qualitative findings (interviews: five patients, two family carers, four researchers; focus groups: PR and HaH service HCPs) demonstrated that trial and intervention processes were acceptable, clinically beneficial and safe, but did not explain the disparity between questionnaire-based vs physical outcome measure completion rates.

Conclusion The findings suggest an efficacy trial which investigates home-based exercise training integrated within a HaH service following hospitalisation for an AECOPD would be safe and acceptable to patients, family carers, HCPs and researchers alike, and is qualitatively felt to be of clinical benefit. However, additional piloting is required to optimise intervention fidelity and study processes given the low recruitment rates, high drop out of the control group and poor uptake of some physical assessments.

S24 IS A NOVEL DIGITAL BREATHING & ENERGY MANAGEMENT PROGRAMME EFFECTIVE IN REDUCING SYMPTOMS OF LONG COVID?

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10.1136/thorax-2021-BTSabstracts.30

Introduction The most common symptoms of 'Long COVID' which is defined as symptoms >12 weeks post COVID infection, are breathlessness and fatigue. Breathing retraining and holistic management for patients suffering with ongoing symptoms of COVID has been recommended to help manage these symptoms.[1] Ensuring quality rest and activity energy management is essential for the management of chronic fatigue.[1,2] The aim of this study is to investigate the effectiveness of a novel digital 6-week breathing & energy group management programme for patients with Long COVID.

Method We conducted a pilot, cohort, observational study using qualitative questionnaires pre and post intervention between Jan -May 2021. The intervention was led by breathing, fatigue specialist physiotherapists and psychological well-being practitioners. Baseline information was gathered with an individual digital assessment. Participants were enrolled to weekly digital group sessions focusing on breathing retraining and establishing a good energy management balance. A follow up re-assessment was completed post intervention.

Results 72 participants aged between 24–81, 45 female,27 male, 57 White British, 7 Black British, 2 Black Asian, 6 Other Ethnicity were enrolled. Baseline data showed 87% (n=63) had a breathing pattern disorder (Breathing Pattern Assessment Tool Score> 4.) 69% (n=50) had signs of hyperventilation syndrome (Nijmegen score > 23). 77% were suffering with severe fatigue (Fatigue Severity Scale (FSS) > 5). Outcome measures used were the Self-Reported Chronic Respiratory Disease Questionnaire (SR -CRDQ), General Anxiety Disorder 7 (GAD7), Patient Health Questionnaire PHQ9 and FSS. 86% (n=62) patients had a clinically significant improvement in at least 1 of the SR-CRDQ domains (breathlessness, emotion, fatigue and mastery).53% (n=38) had a clinically significant reduction in FSS. 51% (n=37) patients had a clinically significant improvement in anxiety or depression.

Conclusion Analysis shows that a digital, novel 6 week breathing and energy management programme was beneficial for patients suffering Long COVID. Continued investigation and further research is required to evaluate the effectiveness of breathing retraining and energy management for patients suffering with Long COVID.

REFERENCES

1. George PM, *et al*. Respiratory follow-up of patients with COVID-19 pneumonia. *Thorax* 2020.
2. Updated NICE guidance on chronic fatigue syndrome. *BMJ* 2020.

S25 CARDIOPULMONARY EXERCISE TESTING TO EVALUATE EXERCISE LIMITATION AND SHORTNESS OF BREATH IN LONG COVID

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10.1136/thorax-2021-BTSabstracts.31

Introduction Approximately 10% of COVID survivors experience long-term sequelae, with fatigue and exercise limitation most frequently reported. The physiological drivers of these symptoms remain unclear. Incremental cardiopulmonary exercise testing (CPET) is a routine clinical assessment used to evaluate exercise limitation but its utility in long COVID is unknown.

Methods Consecutive patients with non-hospitalised SARS-CoV2 infection referred for standard-of-care CPET to investigate persistent exercise limitation were identified. Patient demographic and clinical information were extracted, and standard CPET parameters were collected and analysed. Ethical approval was obtained under the UHS REACT COVID observational database (REC-20/HRA/2986).

Results Nine patients were included in this pilot analysis. 55% male, median (mdn) 47 years, 6 to 12 months post SARS-CoV-2 infection. Reported pre-morbid exercise and fitness levels were above average. Patients demonstrated impaired exercise capacity, peak oxygen uptake [VO_2peak] (mdn 23.3ml/kg/min, 81% predicted) and oxygen uptake at anaerobic threshold [AT] (mdn 13.4 ml/kg./min). AT as percentage of VO_2peak was reduced (mdn 45%) suggesting significant deconditioning. Oxygen-pulse (O_2 pulse) percentage predicted was reduced (mdn 80%) suggesting impaired oxygen delivery and/or muscle oxygen utilisation (table 1). None of the patients demonstrated respiratory limitation to exercise. All patients had normal baseline cardiac function. Six were referred for a Cardiac MRI

Abstract S25 Table 1 Preliminary CPET data for patients with persistent symptoms following non-hospitalised SARS-CoV2 infection, demonstrating reduced levels of aerobic fitness compared to% predicted, as assessed by oxygen uptake at peak exercise, oxygen uptake at anaerobic threshold (AT) and O2 pulse.

Patient number	Peak oxygen uptake as% predicted	Peak AT as% of peak oxygen uptake	O2 pulse as% predicted	VEVCO2 slope	Breathing reserve (litres/ minute)
1	110	69	101	26.9	59
2	70	31	76	22.6	138
3	91	45	80	31.4	36
4	108	63	93	28.1	84
5	81	46	78	27.7	31
6	81	44	82	26.4	71
7	111	47	106	25.4	69
8	61	33	70	27.5	96
9	64	43	78	29.6	40

after CPET, all of which demonstrated normal biventricular function.

Conclusions CPET provided an objective measure of functional limitation in our preliminary patient cohort, profound deconditioning was apparent. Given that our patient has normal cardiac function, it is possible that the reduction in O_2 pulse reflects an intrinsic impairment in muscle oxygen utilisation. We have demonstrated similar patterns of exercise limitation in cancer patients undergoing chemotherapy, and subsequent improvements in their exercise training capacity following a 12 week personalised exercise training program.[1] Exercise intervention studies are needed in these patients to determine optimal rehabilitation strategies.

REFERENCE

1. West, *et al*. *Br J Anaesth*. 2015;**114**(2):244–5.

COPD exacerbations: prevention, treatment, recovery

S26 EFFECT OF SINGLE-INHALER EXTRAFINE BECLOMETASONE/FORMOTEROL/GLYCOPYRRONIUM PMDI (BDP/FF/GB) COMPARED WITH TWO-INHALER FLUTICASONE FUROATE/VILANTEROL DPI + TIOTROPIUM DPI (FLF/VIL+TIO) TRIPLE THERAPY ON HEALTH-RELATED QUALITY OF LIFE (HRQOL) IN PATIENTS WITH COPD: THE TRISTAR STUDY

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10.1136/thorax-2021-BTSabstracts.32

Rationale To evaluate the effect of single-inhaler extrafine BDP/FF/GB pMDI vs two-inhaler (FLF/VIL+TIO) triple therapies on HRQoL in patients with COPD to support market access dossiers in Europe.

Methods In this phase III, multicenter, randomized study patients received BDP/FF/GB 100/6/12.5 µg extrafine pMDI 2 inhalations BID or FLF/VIL 100/25 µg 1 inhalation QD + TIO 18 µg/d 1 inhalation QD for 26 weeks. The primary efficacy variable was the change from baseline in the St. George Respiratory Questionnaire (SGRQ) total score at Wk 26 in the intent-to-treat (ITT) and per-protocol (PP) populations, with non-inferiority defined as an upper confidence limit of the adjusted mean difference between treatments <4 units. Secondary endpoints included SGRQ response (defined as a decrease of ≥4 units in total score), change in pre-dose FEV_1 at Wk 26, and rate of moderate-to-severe COPD exacerbations over 26 weeks.

Results A total of 1157 patients were randomized (1095 completed), of whom 53.5% were <65 years of age, 75.5% males, 54.4% current smokers and 84.1% had 1 exacerbation in the past year. Baseline SGRQ total score was 52.8. In both groups the adjusted mean change from baseline in the SGRQ total score significantly decreased at Wk 26, with -6.77 for BDP/FF/GB and -7.82 for FLF/VIL+TIO in the ITT population. Non-inferiority was demonstrated in both ITT and PP populations, with an upper confidence interval of the adjusted mean difference below 4. SGRQ response rates at Week 26 were similar (51.1% and 53.0%) and pre-dose FEV_1 mean changes from baseline were 59 and 105 mL ($p<0.001$). Adjusted rate ratio was 1.086 ($p=0.525$) for moderate-to-severe exacerbations and 0.568 for severe exacerbations ($p=0.068$). Serious TEAEs occurred in 39 (6.7%) and 56 (9.7%) in each group, respectively.

Conclusion Treatment with BDP/FF/GB extrafine pMDI for 26 weeks significantly improved HRQoL as measured by the SGRQ and was non-inferior compared to FLF/VIL+TIO. Lung function improved with both treatments but more so with FLF/VIL+TIO whereas a larger reduction in severe exacerbations occurred with extrafine BDP/FF/GB. Both treatments were safe and well tolerated.

Please refer to page A188 for declarations of interest related to this abstract.

S27 ARE PATIENTS WITH COPD MORE ADHERENT TO FLUTICASONE FUROATE/UMECLIDINIUM/VILANTEROL (FF/UMEC/VI) COMPARED WITH MULTIPLE-INHALER TRIPLE THERAPY IN A REAL-WORLD UK PRIMARY CARE TREATED POPULATION?

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10.1136/thorax-2021-BTSabstracts.33

Background and Objectives Triple therapy with inhaled corticosteroid, long-acting muscarinic antagonist and long-acting β2-agonist (ICS/LAMA/LABA) is recommended for patients with COPD who continue to experience exacerbations on dual therapy (LAMA/LABA or ICS/LABA). Adherence to multiple-inhaler triple therapy (MITT) has previously been shown to be inadequate. Single-inhaler triple therapy, such as fluticasone furoate/umeclidinium/vilanterol (FF/UMEC/VI), may improve adherence due to decreased treatment complexity. This study investigates the real-world comparative adherence to FF/UMEC/VI vs any MITT combination in UK patients with COPD.

Methods This retrospective analysis of linked UK primary and secondary care data (Clinical Practice Research Datalink [CPRD] Aurum; Hospital Episode Statistics [HES]) indexed patients with COPD on the first prescription of FF/UMEC/VI or MITT between November 2017 and June 2019. Inclusion

criteria were age ≥35 years, COPD diagnosis, forced expiratory volume in 1 second/forced vital capacity (FEV_1/FVC) <0.7, linkage to HES, and continuous GP registration for 12 months pre-index and 6 months post-index. Patients were new users of MITT or FF/UMEC/VI at index. Inverse probability of treatment weighting (IPTW) was used to balance baseline characteristics including sociodemographics, FEV_1% predicted, symptom scores, prior exacerbations, prior respiratory therapy and comorbidities. Adherence was measured using proportion of days covered (PDC) by days' supply of FF/UMEC/VI or MITT prescriptions over 6,12, and 18 months post-index. PDC calculations did not include potential stockpiling and MITT patients were required to have supply of all components for days to be considered covered. Analyses included both proportion of adherent patients (PDC ≥0.80) and mean PDC.

Results In total, 1,319 FF/UMEC/VI and 4,092 MITT users met the inclusion criteria. IPTW provided good balance of baseline characteristics demonstrated by standardised mean difference <10% for all covariates. Patients with COPD initiating FF/UMEC/VI had significantly higher adherence than MITT users over 6, 12 and 18 months, using both categorical (PDC ≥0.80) and continuous (mean PDC) adherence measures (Results presented in table 1); p≤0.001 for all comparisons.

Conclusion In the UK, patients with COPD initiating FF/UMEC/VI have significantly better adherence compared with patients initiating MITT.

S28 HOME HUMIDIFIED HIGH-FLOW THERAPY FOLLOWING SEVERE EXACERBATION OF COPD: A MIXED-METHODS FEASIBILITY RANDOMISED CONTROL TRIAL

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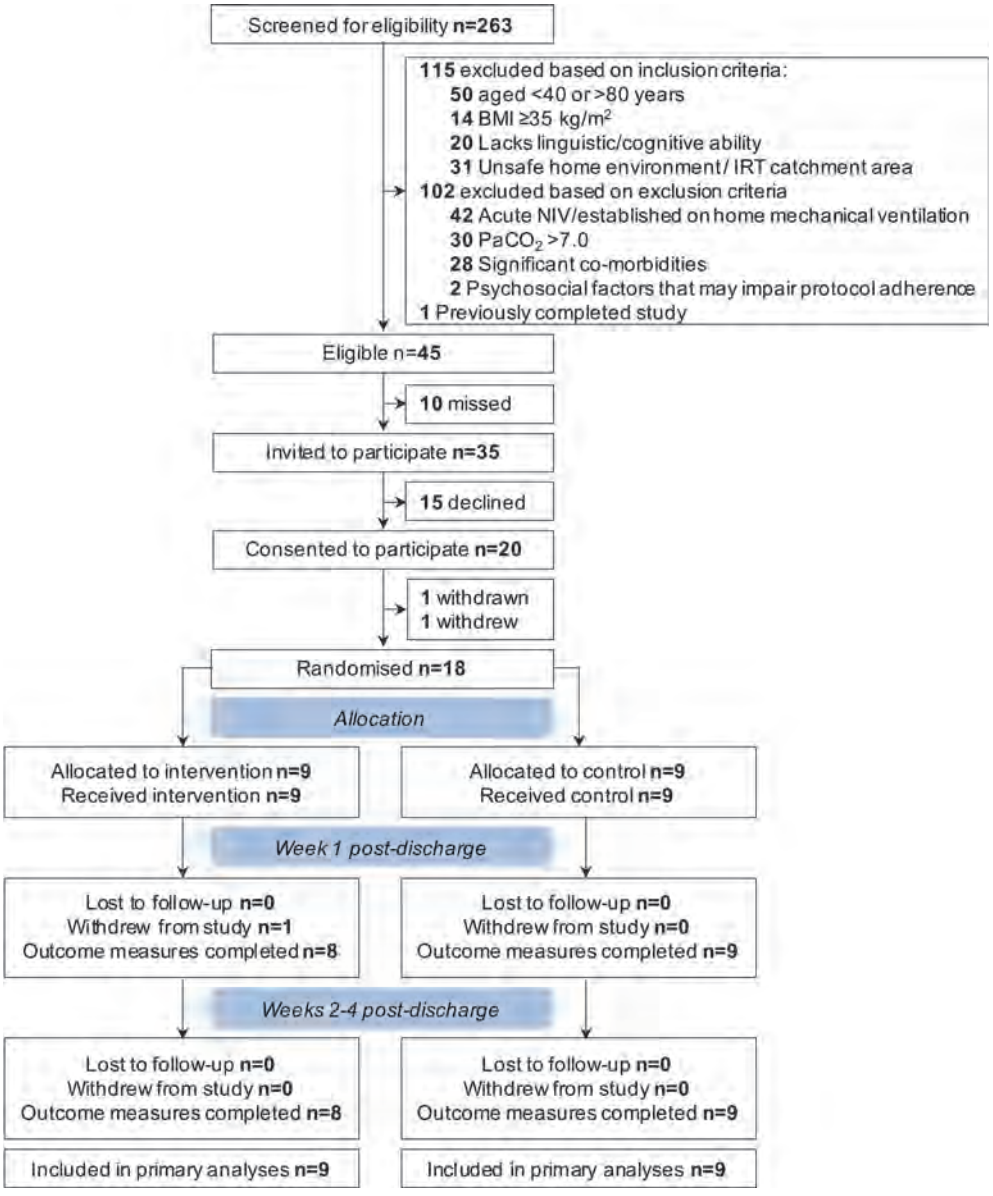
Introduction Patients recovering from severe acute exacerbations of COPD (AECOPD) have a 30-day readmission rate of



Abstract S28 Figure 1 Patient flow diagram

25%. High-flow therapy (HFT) improves mucociliary clearance, dead space washout and pulmonary mechanics in stable COPD. This study aimed to determine the feasibility of a Phase III randomised control trial (RCT) of home HFT to improve clinical, patient-reported and physiological outcomes following severe AECOPD.

Methods Mixed-methods feasibility RCT (quantitative primacy, concurrently embedded qualitative evaluation) (NCT03899558). Consecutive hospitalised AECOPD patients, aged 40–80, BMI≤35kg/m^2, $PaCO_2$≤7kPa, not requiring acute or home mechanical ventilation were randomised to receive usual care or additional home HFT and received weekly home-based follow-up. Semi-structured interviews were performed in week 4. Feasibility outcomes were recruitment, protocol adherence, device acceptability. Progression criteria: ≥40% of eligible patients randomised, complete data in >70%, no device-related serious adverse events (SAE).

Results *Feasibility*: Between June 2019–March 2020, 263 patients screened, 45 eligible, 15 declined, 18 (40%) randomised (figure 1). Mean±SD/median(IQR) age 69±5, 44% female, BMI 22.5±5kg/m^2, $FEV_1$32±12%. Discharge HFT settings: 37°C, 25–30L/min. Adherence to assessments, questionnaires and parasternal EMG (EMG_{para}) 100%, spirometry 91%, complete data in 83%. By week 4, HFT use was 2.4 hours/day. There were no device-related SAE. Four themes relating to HFT acceptability were identified: technical, daily routine, impact on symptoms, sensory-affective influence. Facilitators to use included device simplicity and sputum clearance, barriers were warmup time and excessive flow/temperature. *Exploratory*: The HFT group had a 59% risk of 30-day re-exacerbation/readmission (OR 0.41, 95%CI 0.05–3.31). Breathlessness (mBorg) and neural respiratory drive index ($EMG_{para\%max}$.bpm) improved in the HFT group (admission to week 4 change (Δ) and repeated measures ANOVA significance: Δ-5(-6 to -3),p<0.001 and Δ-214±95%.bpm,p=0.02, respectively), not controls (Δ-2±3,p=0.25 and Δ-207±299%.bpm,p=0.10, respectively). Health status (COPD assessment test) improved in the HFT (Δ-12±5,p<0.001) and control groups (Δ-12±7,p=0.01). Total sleep time fell in the HFT group (Δ-84±97min,p=0.02). There were no changes in physical activity.

Conclusions This study design was determined to be feasible, with all progression criteria met. A Phase III RCT is warranted to evaluate the effects of home high-flow therapy on 30-day re-exacerbation/readmission and patient-reported and physiological outcomes in this high-risk cohort.

S29 PHYSICAL ACTIVITY AND SLEEP QUALITY AS RELATED TO PATIENT-REPORTED OUTCOMES AND PHYSIOLOGY DURING RECOVERY FROM SEVERE COPD EXACERBATION

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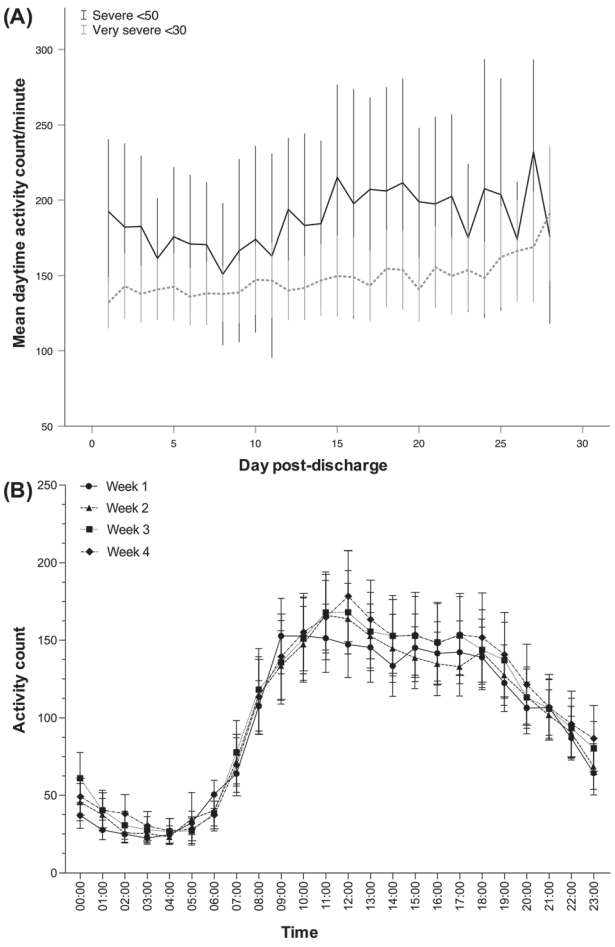
10.1136/thorax-2021-BTSabstracts.35

Introduction Physical activity (PA) and sleep quality are commonly impaired in COPD, are associated with increased exacerbation frequency, healthcare utilisation and death, and deteriorate during acute exacerbations (AECOPD). Their post-discharge trajectories following hospitalisation with AECOPD and associations with patient-reported and physiological outcomes have not been reported. This study aimed to evaluate (1) daily changes in PA and sleep, (2) influences of individual characteristics on PA and sleep and (3) relationships between PA and sleep and patient-reported and physiological outcomes following severe AECOPD.

Methods Prospective, single-centre observational study (NCT03443505,NCT01361451). Hospitalised AECOPD patients underwent wrist-worn actigraphy monitoring for 28 days post-discharge and were evaluated 1- and 4-weeks post-discharge.

Results Data from 1601 days and 1415 nights from 67 patients were analysed. Mean±SD/median(IQR) age 69±9, 57% female, BMI 22.4(18.9–28.4)kg/m^2, FEV_1 27%predicted, 24% readmitted within 28 days. Using repeated measures ANOVA, PA increased in the 4 weeks post-discharge (F=8.47, p<0.001) and was lower in those with FEV_1 <30%predicted (figure 1a), and total sleep time fell (F=2.70,p=0.049). A circadian rhythm of PA was plotted using 2,898,935 30-second epochs (figure 1b). Linear mixed-model regression



Abstract S29 Figure 1 (A) Daily physical activity in patients with severe (n=15) or very severe (n=48) airflow obstruction, (b) Hourly physical activity count per 24-hour period for 4 weeks post-discharge following sentence AECOPD.

demonstrated associations between PA and age (β=-2.37, p=0.01) and lean mass (β=2.45,p=0.002). PA was lower in males (β=-49.84,p=0.001), on weekends (β=-5.49, p=0.01) and in those who died within 1-year (β=-41.24,p=0.04), and was associated with total sleep time (TST) (β=0.01,p=0.003), EXACT score (β=-0.97,p=0.002), COPD assessment test (β=-1.63,p=0.02), FEV_1 (β=46.38,p<0.001), inspiratory capacity (β=44.17,p<0.001), PI_{max} (β=2.14,p<0.001) and neural respiratory drive, measured using parasternal EMG (β=-2.12, p=0.01). Patients readmitted within 28-days exhibited poorer sleep quality than non-readmitted patients (TST: β=-110, p=0.004, latency: β=34,p=0.03).

Conclusions This study provides a novel insight into the improvement in daytime activity occurring in the 28 days following hospital discharge after severe COPD exacerbation. Physical activity related inversely to age, symptom burden, health status and neural respiratory drive, and positively to lean mass, respiratory muscle strength, expiratory airflow and inspiratory capacity. Total sleep time fell following hospital discharge, and sleep quality was lower in readmitted patients. Future research is needed to evaluate the impact of targeted interventions that enhance physical activity and sleep quality on hospital readmission in this high-risk population.

S30 PREDICTING HOSPITAL LENGTH OF STAY FOR ACUTE ADMISSIONS IN PATIENTS WITH COPD

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10.1136/thorax-2021-BTSabstracts.36

Introduction Accurate predictions of hospital length of stay (LOS) at the time of admission allows clinicians to direct patients to the most appropriate medical services, prevent overcrowding in emergency departments via improved patient flow, and better manage hospital resources.

Objectives To develop, evaluate and explain machine learning classifiers that predict prolonged LOS (≥2 days) using information that is known at the time of acute admission, does not change during the patient's hospital stay, and would be easy to input to a model deployed in a clinical setting.

Methods A SafeHaven dataset of de-identified electronic health records for acute admissions of patients with COPD to four Scottish hospitals between January 2010 and March 2019 was prepared. Using XGBoost algorithms and a binary classifier (admission <48 hours or >48 hours) we developed a set of machine-learning models that predict whether a patient will have a prolonged LOS and investigated which variables contribute the most to prediction performance. We produced separate models for: 1) all acute admissions in the study period (n=75387); 2) COPD related admissions (n=12137); 3) admissions relating to COPD or a broader set of respiratory conditions (n=20134). We evaluated model performance on an unseen test data set based on Receiver Operating Characteristic and Precision Recall Curves, and the precision, recall and F1 scores. Further, we compared models to two established clinical scores to predict emergency department disposition: the Glasgow Admission Prediction Score (GAPS) and the Ambulatory Score (Ambs). We used SHapley Additive exPlanations to explain why specific model predictions are made for individual patients.

Results Our models highlighted several key factors that contribute to prolonged LOS in COPD patients. Some relate to patient clinical history, such as certain existing comorbidities, previous diagnoses on discharge and LOS for previous hospital visits, which is rarely considered in LOS prediction models.

Conclusions We have identified several factors relating to clinical and admission history that influence COPD patients' likelihood of prolonged acute admissions and are able to explain the rationale behind individual predictions. Since these factors would be known at admission time, they could be passed to a deployed LOS predictive model to aid clinical decision making.

S31 HOME OXYGEN THERAPY AND SMOKING: PLAYING WITH FIRE?

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10.1136/thorax-2021-BTSabstracts.37

Introduction Long term oxygen therapy (LTOT) use has increased significantly in the last 40 years in chronic hypoxaemic COPD patients, as it has been shown to confer a survival benefit. Smoking is cited as a contraindication for LTOT due to elevated risks of fire.[1] Despite warnings about potential dangers, some individuals continue to smoke whilst on LTOT.

Methods We conducted a retrospective review of all consecutive hypoxaemic COPD patients considered for LTOT between January 2016 and December 2017, with follow up until January 2021, in order to evaluate the survival difference between ex-smokers and current smokers with hypoxaemic COPD on LTOT, and current smokers eligible for – but not currently on – LTOT. Note was made of smoking status at time of death/censoring. Prior to LTOT, all patients were provided with standard fire safety information and risk-reducing interventions.

Results There were 74 eligible patients (mean±SD average $ppFEV_1$ 43±20, BMI 28±9kg/m^2, 48 female), of whom 28 were current smokers at their time of death and 46 ex-smokers. Of the 74, 13 current smokers did not receive LTOT due to fire safety concerns or individual refusal. Current smokers had a significantly lower BMI (26±11 vs 49±21, P<0.05) and $ppFEV_1$ (25±10 vs 28±8kg/m^2, P<0.05) than ex-smokers. Comorbidities and age were similar between groups. Survival was assessed using a Kaplan-Meier plot. Survival at 5 years did not differ significantly between current smokers and ex-smokers on LTOT (P>0.9), but survival between current smokers on LTOT versus those not on LTOT was significant (P<0.001). No fire incidents were recorded during the study period.

Conclusions Smoking on LTOT is controversial, with arguments made for discrimination and the conflict between the right to smoke, versus the risk of harm to self and others. Whilst every effort should be made to discourage smoking in any form, LTOT may confer survival benefits to carefully risk-assessed smokers under close supervision. A larger study may provide more accurate survival data of LTOT in this cohort.

REFERENCE

1. National Institute for Health and Care Excellence. Chronic obstructive pulmonary disease in over 16s: diagnosis and management, 2018.

Treatment and adherence in asthma

S32 COMBINATION FIXED-DOSE BETA AGONIST AND STEROID INHALER AS REQUIRED FOR ADULTS OR CHILDREN WITH MILD ASTHMA: A COCHRANE SYSTEMATIC REVIEW

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10.1136/thorax-2021-BTSabstracts.38

Background We aimed to evaluate the efficacy and safety of single combined fast-acting beta$_2$-agonist/inhaled corticosteroid (FABA/ICS) inhaler only used as needed in people with mild asthma.

Methods We performed a Cochrane meta-analysis of randomised trials utilising as-required FABA/ICS inhalers for >12 weeks.[1] Primary outcomes included exacerbations requiring systemic steroids, asthma-related hospital or urgent care visits and measures of asthma control.

Results Six studies met our inclusion criteria (n=9,657 participants).

Compared with as-required FABA alone, as-required FABA/ICS reduced exacerbations requiring systemic steroids (OR 0.45, 95% CI 0.34 to 0.60, high-certainty evidence). FABA/ICS as-required may also reduce the odds of asthma-related hospital or urgent care visits (OR 0.35, 95% CI 0.20 to 0.60, low-certainty evidence). Changes in asthma control and spirometry were less than the minimum clinically-important difference (MCID). FABA/ICS as-required was associated with reductions in FENO, probably reduces the odds of adverse events (OR 0.82, 95% CI 0.71 to 0.95) and may reduce total systemic steroid dose (MD -9.90, 95% CI -19.38 to -0.42).

Compared with regular ICS plus FABA as-required, there may be little or no difference in the number of people with asthma exacerbations requiring systemic steroid with FABA/ICS as-required (OR 0.79, 95% CI 0.59 to 1.07, low-certainty evidence). The odds of asthma-related hospital or urgent care visits may be reduced in those taking FABA/ICS as-required (OR 0.63, 95% CI 0.44 to 0.91, low-certainty evidence).

Changes in asthma control, spirometry or asthma-associated quality of life, were less than the MCID. Adverse events, total systemic corticosteroid dose and mortality were similar between groups. FABA/ICS as-required was likely associated with reduced daily exposure to inhaled corticosteroids compared to regular ICS (MD -154.51 mcg/day, 95% CI -207.94 to -101.09).

Conclusions FABA/ICS as-required is clinically effective in adults and adolescents with mild asthma. It reduced exacerbations, hospital admissions, unscheduled healthcare visits, exposure to systemic corticosteroids and probably reduces adverse events compared with FABA as-required alone. FABA/ICS as-required is as effective as regular ICS and reduced asthma-related hospital admissions or unscheduled healthcare visits, and average exposure to ICS, and is unlikely associated with increased adverse events.

REFERENCE

1. Cochrane Database Syst Rev 2021;5:CD013518.

Please refer to page A188 for declarations of interest related to this abstract.

S33 A PRAGMATIC, RANDOMISED CONTROLLED TRIAL OF A TAILORED PULMONARY REHABILITATION PACKAGE IN DIFFICULT-TO-CONTROL ASTHMA ASSOCIATED WITH ELEVATED BODY MASS INDEX

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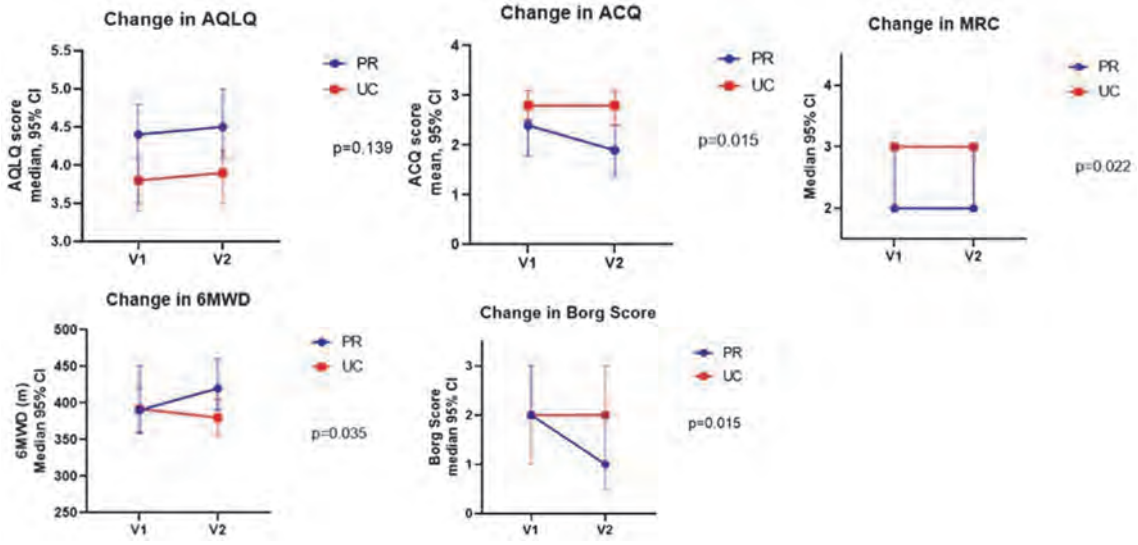
10.1136/thorax-2021-BTSabstracts.39

Background Difficult-to-control asthma associated with elevated body mass index (BMI) represents a significant challenge, with limited treatment options. The effects of pulmonary rehabilitation (PR) in this population are uncertain.



Abstract S33 Figure 1

Methods This randomised controlled trial compared an asthma-tailored PR programme to usual care (UC) in participants with uncontrolled asthma and BMI ≥25 kg/m^2. PR comprised an hour of education and of exercise each week for eight weeks. Primary outcome was difference in change in Asthma Quality of Life Questionnaire (AQLQ) in PR versus UC groups post intervention. Secondary outcomes included difference in change in other asthma outcomes including asthma control questionnaire-6 (ACQ6), Medical Research Council (MRC) dyspnoea score, six-minute walk distance (6MWD) and post-exercise Borg breathlessness score. Responder analyses compared proportions reaching the minimum clinically important difference (MCID) for AQLQ and ACQ6.

Results 95 participants were randomised 1:1 to PR or UC; median age was 54, with 60% female and median BMI 33.8kg/m^2. 18 participants withdrew prior to second visit, meaning 77 were included in analysis. Median (IQR) change in AQLQ was not significantly different: 0.3(-0.2 to 0.6) in PR and -0.1(-0.5 to 0.4) in UC, p= 0.139. There was no difference in proportion reaching MCID for improvement in AQLQ: 13(39%) in PR and 10(23%) in UC, p=0.184. Mean change in ACQ6 was significantly different: -0.4(95% CI -0.6 to -0.2) in PR and 0(-0.3 to +0.3) in UC, p=0.015*. In ACQ6 responder analysis, MCID was reached by 18 participants in PR group (54.5%) versus 10 in UC (22.7%), p=0.009*. Changes in MRC dyspnoea score (p=0.022*), 6MWD (p=0.035*) and Borg breathlessness (p=0.015*) were significantly different in favour of PR. A post-hoc analysis of PR group revealed baseline FeNO was significantly lower in ACQ6 responders (median (IQR) 18(8.5–41)) than non-responders (47(17–71)), p=0.020*; and in AQLQ responders (14 (8.5–44.5)) compared to non-responders (40(19–71)), p=0.038*.

Conclusion Pulmonary rehabilitation improves asthma control and reduces perception of breathlessness in participants with difficult-to-control asthma associated with elevated BMI. It should be considered as additional therapy for this group. Lower FeNO in PR responders suggests it may be of most value in type-2 low phenotype obese asthma.

S34 A MULTI-DISCIPLINARY APPROACH ENSURING SUCCESSFUL TRANSITION FROM PAEDIATRIC TO ADULT ASTHMA CARE – A FOCUS ON TREATMENT ADHERENCE

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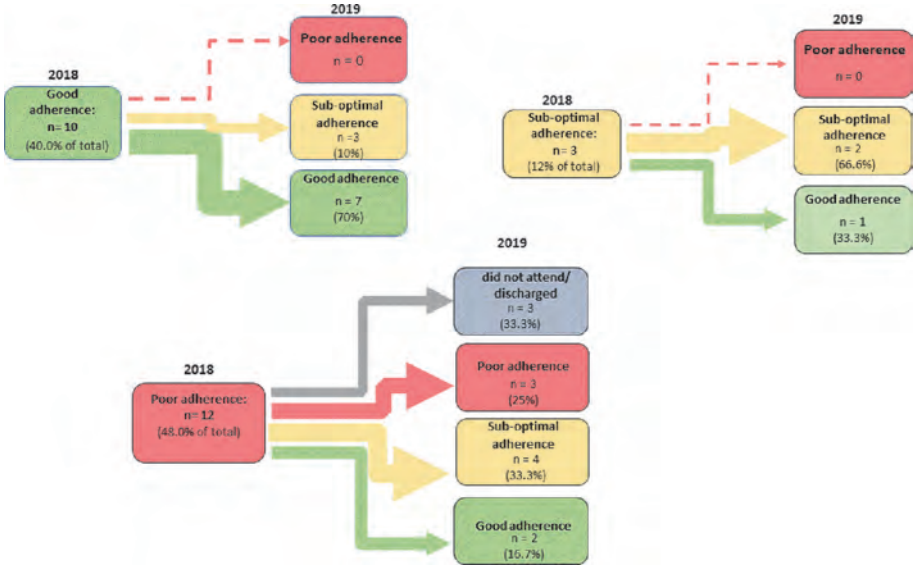
10.1136/thorax-2021-BTSabstracts.40

Background Adolescence is a high-risk time for young asthma patients, with increased risk of asthma-related morbidity and mortality. Evidence suggests that in adolescence, over half of prescribed inhaled corticosteroid (ICS) prescriptions are not adhered to. This, a modifiable cause of troublesome symptoms, significant risk of exacerbations and death, warrants attention. Adolescents with severe asthma are seen at Guy's Young Adult Asthma Service (YAAS), having transitioned from the Children's Hospitals at King's College Hospital and the Evelina, where they are seen jointly by paediatric and adult teams during the transition period. They are supported during that time by a dedicated multi-disciplinary team including pharmacists supporting adherence.

Methods We conducted a retrospective review of patients transitioning from the paediatric teams to YAAS between October 2018 and September 2019. Patient's demographic and clinic characteristics and their adherence, quantified via Medicines Possession Ratio (MPR), the number of prescriptions issued compared with those expected to be issued, were recorded at the last joint paediatric-adult clinic appointment (transition) and again after 12 months within the adult service. Adherence was defined as poor < 50% MPR, suboptimal < 75% MPR and optimal >75% MPR.

Results 25 patients (68% female) with a mean age of 17.89 (±0.83) transitioned to the adult service. At transition, adherence was optimal in 10/25 (40%), suboptimal in 3 (12%) and poor in 12 (48%) patients. The mean blood eosinophil count (BEC) was 0.41 x10^9/l (±0.33), fraction of exhaled nitric oxide (FeNO) 73.2 ppb (±59) and FEV1% predicted 89% (±10.7). After 12 months, 22/25 patients remained under the



Abstract S34 Figure 1 Change in adherence patterns over 12 months

adult service, 1 patient had been discharged and 2 patients did not attend. Adherence was optimal in 10 (44.5%), suboptimal in 9 (40.9%) and poor in 3 (13.64%) patients (see figure 1). Their mean BEC was 0.35 x10^9/l (±0.33), FeNO 48.7 ppb (±38.1) and FEV1% was 86.8% (±12.2).

Conclusion While there was an incremental improvement in adherence during the first year of adult care with resultant improvements in asthma biomarkers, on-going support is needed to further increase medicines use and to ensure this behaviour persists.

S35 CREATING BEHAVIOURAL PERSONAS TO DRIVE BETTER DESIGN IN HEALTH TECHNOLOGY FOR ASTHMA SELF-MANAGEMENT

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10.1136/thorax-2021-BTSabstracts.41

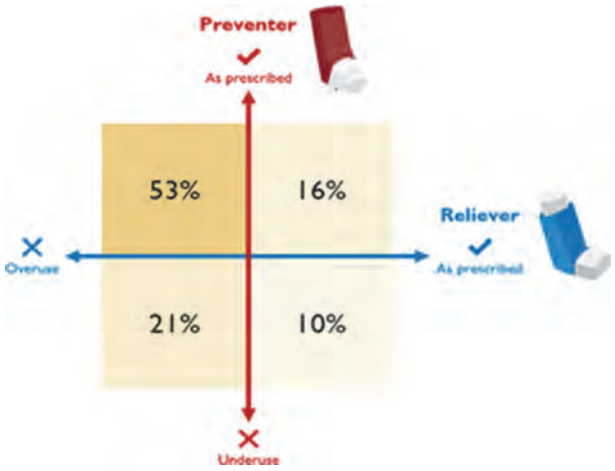
Introduction and Objectives The health burden from asthma can be reduced through better provision of basic care and better self-management. Most health technology products tend to target a narrow range of behaviours with limited behaviour change techniques (BCTs), take a homogeneous approach towards the diverse population of people with asthma and have poor uptake.

Objective to identify and characterise distinct behavioural self-management archetypes among UK adults with asthma with the aim of creating behavioural personas that can be used by product developers to better address the needs of people with asthma.

Methods We conducted a scoping review of grey and academic literature, followed by workshops with subject matter experts to identify key behaviours and influences relevant to asthma self-management. We then conducted a rapid review and behavioural analysis on these key behaviours which were then synthesised into a behavioural systems map. A survey was constructed to explore a subset of key behaviours and influences in more detail including asthma management, asthma control, inhaler use, support seeking, monitoring, and technology use. The survey was administered to 2,324 people reflective of the UK adult asthma population. The results were analysed and synthesised using mixed methods. Data were segmented using Multiple Correspondence Analysis and k-means cluster analysis, and further statistical analysis was performed to identify factors independently associated with adherence behaviour. The results were synthesised into behavioural personas that characterise people with optimal vs. suboptimal preventer inhaler adherence in behavioural terms, alongside relevant design prompts and suggested BCTs.

Results Segmenting by inhaler use revealed behaviours distributed as shown in figure 1. Segmenting by adherence to preventer-type inhalers alone revealed pronounced differences between optimal and sub-optimal behaviour clusters in terms of age and behavioural factors (including: skills, decision making, behavioural regulation, environmental opportunities, attitudes, motives, intentions, beliefs, identity, and emotions).

Conclusions We have developed unique insight into behaviours of people with asthma and the influences on these behaviours.



Abstract S35 Figure 1

We believe this work can contribute to a paradigm shift in the design of asthma health technology products, towards targeting new behaviours and their influences for change and ultimately driving better self-management and fewer asthma deaths.

S36 PRESCRIBING PATTERNS AND TREATMENT ADHERENCE IN PATIENTS WITH ASTHMA DURING THE COVID-19 PANDEMIC

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10.1136/thorax-2021-BTSabstracts.42

Introduction and Objective The COVID-19 pandemic has witnessed a reduction in asthma exacerbations in the UK. Several factors may underpin this, including reduced transmission of seasonal viruses and improved use of or adherence to inhaled corticosteroids (ICS). This study aims to investigate whether ICS use has changed during the pandemic for patients with asthma.

Methods Using the OpenPrescribing database, we analysed prescribing patterns of ICS, salbutamol and peak flow meters from January 2019 to January 2021 across England. Additionally, using a sample asthma cohort from 3 primary care practices, we assessed individual prescription patterns and ICS adherence across the two-year period. ICS adherence has been defined according to the medication possession (MPR) ratio: good (≥75%), sub-optimal (50–74%), poor (25–49%) and non-adherence (<25%).

Results A sharp increase in national ICS prescriptions was observed at the start of the pandemic in March 2020 representing a 50% increase compared to February 2020. Thereafter national ICS prescription rates appear to have returned to normal levels. The sample asthma cohort included 1132 patients (762 patients treated with ICS across 2019 and 2020). Overall, adherence to ICS improved in 2020 ($P<0.001$), with the proportion of patients meeting 'good adherence' (≥75%) increasing from 34% to 42% ($P<0.001$). Analysis of this cohort suggested the March 2020 spike predominantly reflected improved adherence rather than a hoarding effect of multiple inhalers or new prescriptions for ICS-naïve individuals. Increasing age was associated with higher

levels of ICS adherence. A similar spike in salbutamol occurred in March 2020, however, an overall reduction in salbutamol prescriptions was seen in 2020 ($P=0.039$). National figures highlighted a progressive increase in prescription of peak flow meters over 2020.

Conclusion A marked spike in national ICS prescriptions occurred in March 2020. This increase appears to reflect improved adherence in patients with low levels of adherence rather than a hoarding effect or large-scale initiation in ICS-naïve patients. Despite a comparable spike in salbutamol prescriptions, 2020 saw an overall reduction in salbutamol prescriptions. Prescription of peak flow meters steadily increased over 2020 in keeping with the need for more remote monitoring.

Beyond acid-fast: diagnosis and treatment of TB in the 21st Century

S37 DUAL STEP INTERFERON-GAMMA RELEASE ASSAY TESTING CAN IMPROVE TUBERCULOSIS (TB) RISK STRATIFICATION IN CONTACTS OF PULMONARY TB: A PROSPECTIVE ADULT HOUSEHOLD CONTACT COHORT STUDY

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10.1136/thorax-2021-BTSabstracts.43

Introduction Studies report modest and variable predictive value of an interferon-gamma release assay (IGRA) test performed 8–12 weeks after index notification, to identify latent tuberculosis (TB) infection at risk of progressing to active TB. There is limited data evaluating predictive value of changes in the IGRA response with serial testing following recent exposure in a low-TB burden setting.

Objectives To quantify the risk of progression to active TB using the serial IGRA response between baseline and 3 months in pulmonary TB contacts.

Methods We performed an ethically approved prospective cohort study of pulmonary TB contacts between September 2015 and May 2018. Participants were recruited immediately after index case notification and had IGRA (QuantiFERON-TB Gold, QFT) test at baseline and 3 months. QFT+ve contacts did not receive chemoprophylaxis, but were followed prospectively up to 4 years with three monthly review during the first 2 years. In contacts developing TB (progressors), whole genome sequencing (WGS) was performed to inform case linkage. We defined changes in serial IGRA response as conversion (QFT negative to positive); or in contacts QFT+ve at baseline, as > 0.27IU/L change in the QFT response, representing >2 standard deviations of the mean serial QFT variability observed in a control group without recent TB exposure.

Results 297 contacts were followed for a median of 1437 days (IQR 1159–1460). 124 contacts (41.8%) were QFT+ve at 3 months, of which 19 seroconverted from baseline. 20 progression events occurred and 6 diagnoses (30%) were made within 3 months of index notification including two QFT-ve cases. The remaining 14 cases were QFT+ve at baseline, and diagnosed after a median of 285 days. All 9 culture confirmed progressors were WGS matched to their index. For QFT+ve contacts, 2-year risk of incident TB was 10.8%, with no significant difference according to index smear status or quantitative QFT value (Table). Serial QFT identified greatest risk in seroconverters (2-year risk =33.6%) but no increased risk in QFT+ve contacts with a significant change after 3 months (table 1).

Abstract S27 Table 1 Two –year incident tuberculosis risks in untreated adults pulmonary TB contacts

	2- year risk (95% CI)
QFT positive (at 3 month)	10.8 (4.8 – 16.5)
Quantitative QFT (at 3 month)	
<1	12.3 (0 – 24.5)
1–4	7.5 (0 – 17.0)
>4	11.7 (0.0 – 19.5)
Serial QFT	
Seroconversion	33.6 (7.5 – 52.3)
If QFT positive at baseline	
Significant increase	6.3 (0 – 14.5)
Significant decrease	2.9 (0 – 8.5)
No significant change	8.8 (0 – 35.8)

Conclusions Our data suggests serial QFT testing at baseline and 3 months after index notification improves risk stratification in pulmonary TB contacts.

Please refer to page A188 for declarations of interest related to this abstract.

S38 EVALUATION OF MYCOBACTERIUM TUBERCULOSIS-SPECIFIC IFN-G, TNF-A, CXCL10, IL2, CCL2, CCL7 AND CCL4 LEVELS FOR ACTIVE TUBERCULOSIS DIAGNOSIS

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10.1136/thorax-2021-BTSabstracts.44

Background Novel diagnostic tests for active tuberculosis (ATB) are urgently needed. We aimed to efficiently and robustly assess whether seven previously identified, promising biomarkers (IFN-g, TNF-a, CXCL10, IL2, CCL2, CCL7 and CCL4) could distinguish patients with ATB within a cohort of patients presenting with the full clinical spectrum of suspected TB in routine practice.

Methods We designed a nested case-control study (*n=92)* within the IDEA study.[1] Uniquely, we enriched our ATB population to include ~50% patients in whom current IGRAs fail (and unmet clinical need is greatest), to assess whether any biomarker offered superior diagnostic accuracy to IFN-g. We utilised stored supernatants from QFT-GIT tests performed in the IDEA study and compared *Mycobacterium tuberculosis*-specific biomarker levels in patients with ATB and non-tuberculosis respiratory diseases using Meso Scale Discovery U-PLEX assays. We analysed group differences using Kruskal-Wallis tests.

Results In phase I, we analysed IFN-g, TNF-a, CXCL10, IL2, CCL2, CCL7 and CCL4 levels in 32 patients. MSD-measured biomarkers (except CCL4*)* detected higher numbers of true positives (TP) compared to QFT-GIT, however, all biomarkers

Abstract S38 Table 1 Biomarker performance of *Mtb*-specific IFN-γ, CXCL10 and CCL2 for ATB diagnosis

Biomarker	Active TB		OD		Sensitivity (95% CI)	Specificity (95% CI)
	True-positive	False-negative	True-negative	False-positive		
QFT-GIT	26	31	28	7	45.6 32.4 – 59.3)	80.0 (63.1 – 91.6)
IFN-γ	41	13	14	19	75.9 (62.4 – 86.5)	42.4 (25.5 – 60.8)
CXCL10	43	12	14	20	78.2 (65.0 – 88.2)	41.2 (24.7 – 59.3)
CCL2	26	28	15	19	48.1 (34.3 – 62.2)	44.1 (27.2 – 62.1)
IFN-γ+CXCL10	44	10	9	24	81.5 (69.2-89.6)	27.3
IFN-γ+CCL2	43	11	6	27	79.6 (67.1 – 88.2)	18.2
CXCL10+CCL2	44	11	7	27	80	20.6
IFN-γ+CXCL10 + CCL2	45	9	4	29	83.3	12.1

Diagnostic performance for a) QFT-GIT (commercially available IGRA test), b) IFN-γ, c) CXCL10, d) CCL2, e) IFN-γ + CXCL10 combined test, f) IFN-γ + CCL2 combined test, g) CXCL10 + CCL2 combined test, h) IFN-γ + CXCL10 + CCL2 combined test, in patients with ATB and OD (n=92). Combined test algorithm: AND/OR inclusion criteria.

lost specificity (42.9% increase in false positive (FP) results). TNF-*a*, IL2 and CCL7 had very low raw biomarker concentrations.

In Phase II, based on above results, we analysed IFN-g, CXCL10 and CCL2 in a further 60 patients (table 1). CXCL10 achieved the highest increase in TP results for ATB diagnosis, with 43 TP compared with 26 TP results for QFT-GIT. MSD-measured IFN-*g* detected 41 TP results, while CCL2 only detected 26 TP. All three biomarkers demonstrated >35% loss of specificity compared to QFT-GIT. The QFT-GIT sensitivity and specificity values in our study population were 45.6% and 80% respectively. A 'triple-test' combining IFN-g, CXCL10 and CCL2 results achieved sensitivity 83.3% and specificity 12.1%.

Conclusion Our study provides a unique and novel gating method for efficiently assessing the diagnostic performance of candidate biomarkers for ATB diagnosis. Our study population was purposely engineered to compare candidate biomarkers to QFT-GIT in a clinically-relevant manner and we hope our study design will aid future, targeted efforts for high-quality biomarker follow-up studies.

REFERENCE

1. Whitworth HS, et al. Lancet Infect Dis. 2019;19(2):193–202. PMID:30655049

Please refer to page A188 for declarations of interest related to this abstract.

S39 IS THE TREATMENT OF LATENT TUBERCULOSIS INFECTION AMONGST RECENT MIGRANTS SAFE AND EFFECTIVE IN PRIMARY CARE?

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Introduction The control of latent tuberculosis infection (LTBI) is a key priority in national and global strategies to eliminate tuberculosis (TB). We tested whether a novel community model of care delivered by general practitioners (family physicians) and community pharmacists to treat LTBI amongst recent migrants was effective and safe. Criteria for LTBI testing followed national guidelines.

Methods The CATAPuLT trial (Completion and Acceptability of Treatment Across Primary Care and the community for Latent Tuberculosis) was a pragmatic cluster-randomised, parallel group, superiority trial conducted in 34 general practices in London, UK, comparing LTBI treatment in recent migrants in primary care to secondary care. The primary outcome was treatment completion. Secondary outcomes included treatment adherence, treatment acceptance, adverse events, patient satisfaction, the incidence of active TB and a comparison of costs per case completing treatment.

Results Between September 2016 and May 2019, 7495 patients were offered testing for LTBI, 3624 were tested and 807 returned positive interferon-gamma release assay (IGRA) results. In the primary care arm, 224 were offered and 146 patients accepted treatment. In the secondary care arm, 138 were offered and 130 patients accepted treatment. In primary care, 82.6% of patients accepting LTBI treatment completed it, compared to 86·0% in secondary care. There was no significant difference in treatment completion between the two arms (aOR:0·64, 95%CI:0·31–1·29). There was also no difference in treatment adherence (aOR:0·64, 95%CI:0·32–1·28), drug induced liver injury (DILI) (0·7% vs 2·3%, aOR:0·29, 95%CI:0·03–2·84) or patient satisfaction (aOR:1·80, 95%CI:0·84–3.86). Treatment acceptance was lower in primary care (65·2% vs 94.2%, aOR:0·10, 95% CI:0·03–0·31). The cost per patient completing treatment was lower in primary care with an incremental saving of £315.26.

Conclusions The treatment of LTBI in recent migrants within primary care is effective and safe with lower costs when compared to treatment within secondary care.

Abstract S39 Table 1 Latent tuberculosis infection (LTBI) treatment completion, adherence, acceptance, patient satisfaction and adverse events in the CATAPuLT trial (n=362)

Outcome	Intervention % (N)	Control % (N)	OR (CI)	p	Adjusted OR (CI)	p
Treatment completion						
Treatment completion (missing data imputed)	82·6	86·0	0·70 (0·35-1·38)	0·29	0·64 (0·31-1·29)	0·21
Adherence (Prescription collection and INH urine tests)						
Did not collect prescription	15·6 (19/122)	7·9 (10/127)				
Two or more urine tests negative	0·8 (1/122)	2·4 (3/127)	0·61 (0·31-1·19)	0·15	0·64 (0·32-1·28)	0·21
One negative urine test	7·4 (9/122)	6·3 (8/127)				
All urine tests positive	76·2 (93/122)	83·5 (106/127)				
Treatment acceptance	65·2 (146/224)	94·2 (130/138)	0·10 (0·03-0·31)	<0·001	0·10 (0·03-0·30)	<0·001
Patient satisfaction (score /10)						
7 or lower	3·1 (3/98)	2·5 (3/121)				
8	5·1 (5/98)	8·3 (10/121)	1·84 (0·88-3·87)	0·11	1·80 (0·84-3·86)	0·13
9	14·3 (14/98)	27·3 (33/121)				
10	77·6 (76/98)	62·0 (75/121)				
Serious Adverse Events leading to hospitalisation*	0	0	n/a	n/a	n/a	n/a
Adverse events*						
Drug-induced liver injury (ATS criteria)	0·7 (1/146)	2·3 (3/130)	0·29 (0·03-2·84)	0·29	n/a	n/a

OR: odds ratio, CI: 95% confidence interval *adjusted analyses could not be performed due to the low number of events in each arm

S40 **REDUCING NUMBERS, INCREASING COMPLEXITY: AN EVALUATION OF ENHANCED CASE MANAGEMENT IN THE NORTH CENTRAL LONDON TUBERCULOSIS SERVICE 2013 TO 2020**

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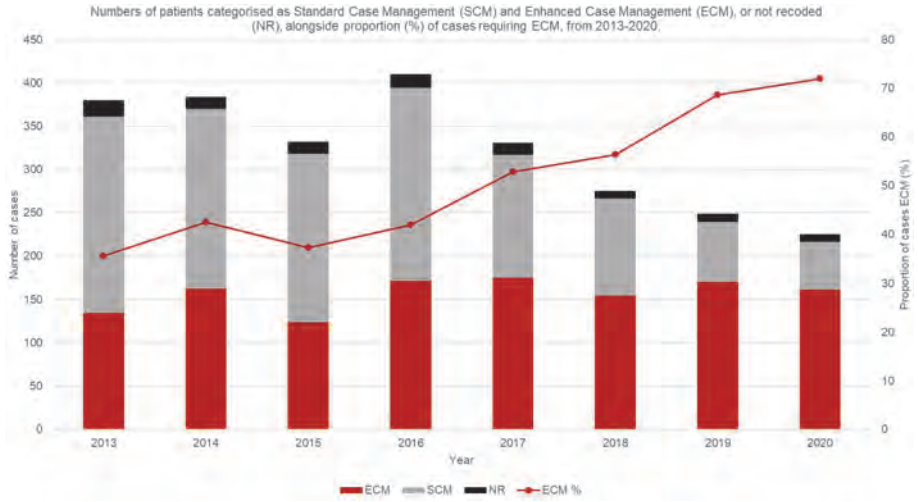
Background North Central London Tuberculosis (TB) service provides care to patients diagnosed with TB across a large, high-prevalence urban area with complex socio-economic demography. In 2013, a system of categorising patients as requiring Standard or Enhanced Case Management (SCM, ECM) was implemented to identify early those who require additional care, including medication support and social care input. From 01/04/2019 patients were further sub-categorised as ECM 1–3 to better align service support with patient care needs. Here we present an analysis of patients' ECM status and clinical outcome from 2013–2020.

Methods A retrospective service evaluation was conducted by extracting all data from the TB database for patients notified between 01/01/2013 and 31/01/2021. Patients were categorised by ECM status (requiring ECM or not, or ECM category after 01/04/2019) and treatment outcome. Differences in proportions of patients by outcome were analysed using Chi-2 testing.

Results 2,587 patients were included. Numbers of notifications have decreased consistently since 2016 (figure 1), while the proportion requiring ECM has increased. Of 2,422 patients with an outcome registered between 2013 and 2020, 87.4% completed treatment 1.7% died with TB contributing, 2.1% died of other causes, and 8.8% transferred or were lost to follow-up. 2,317 had an ECM status recorded and those requiring ECM were less likely to complete treatment (83.2% vs 91.9%, p=0.03) and more likely to die of TB (2.5% vs 1.5%, p=0.01) or be lost to follow-up (11.8% vs 5.7%, p<0.01).

Of 487 patients notified after 01/04/2019, 248 had been sub-categorised: 22.2% as SCM, and 24.6%, 21.2%, 31.9% as ECM1, ECM2 and ECM3 respectively. Of 237 with an outcome, there was no significant difference in treatment completion or loss to follow-up by SCM or ECM category. Number of deaths was too small to evaluate.



Abstract S40 Figure 1

Discussion ECM can be used to identify TB patients with increased clinical and social care needs. However differential outcomes remain. A wide range of socio-economic factors likely contribute to this. Preliminary evidence suggests that providing additional, tailored support to patients categorised as having greater needs (by ECM 1 - 3) may improve treatment completion, and direct resource more appropriately.

S41 THE DIAGNOSTIC WORK UP OF PLEURAL TUBERCULOSIS AND THE UTILITY OF GENEXPERT: 5 YEAR EXPERIENCE FROM A TERTIARY CENTRE

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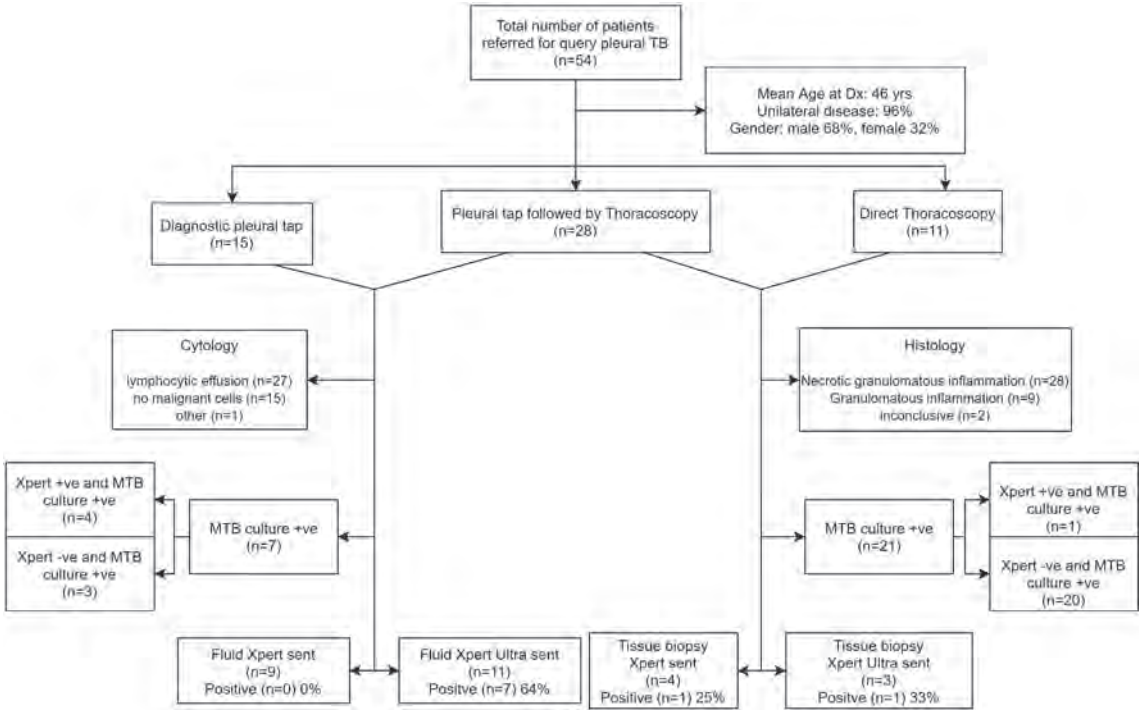
Background The paucibacillary nature of *Mycobacterium tuberculosis* (MTB) in pleural fluid poses challenges in the diagnosis of pleural TB. GeneXpert (GX) is a molecular test which detects the presence of MTB DNA and is validated in sputum specimens. However, its role in pleural TB is unclear. We sought to analyse how a diagnosis of pleural TB may be achieved that also incorporated use of GX in pleural specimens.

Method Retrospective analysis of pleural TB cases on our institutional TB registry between 2015–2019 was performed. Patients underwent either diagnostic thoracentesis (DT), DT and local anaesthetic thoracoscopy (LAT) or direct to LAT. Pleural fluid and biopsy specimens were sent for culture/cytology and culture/histology, respectively. In a proportion of cases GX was performed [Xpert MTB/RIF pre-2018 and Xpert MTB/RIF Ultra 2018 onwards].



Abstract S41 Figure 1 Summary of outcomes from pleural sample analysis

Results Among the 54 pleural TB cases, mean age was 46 years with 68% male. Unilateral disease was detected in 96%. 15/54 underwent DT only, 28 underwent DT+LAT and 11 underwent LAT only. Pleural fluid cytology was lymphocytic in 43%. Pleural fluid culture yielded a diagnosis in (7/43) 16% which was low in comparison to LAT pleural biopsy culture yield 21/39 (54%). LAT pleural biopsy yielded a histological TB diagnosis in 37/39 (95%). Pleural fluid GX MTB/RIF Ultra where performed was more sensitive than GX MTB/RIF in both pleural fluid (64% vs 0%) and pleural biopsy (33% vs 25%).
Conclusion LAT plays an important role in the diagnosis of pleural TB. However, pleural fluid Xpert MTB/RIF Ultra demonstrates potential for added diagnostic value. Further studies are required.

What goes down, must come up: oscillation, obstruction and lung physiology

S42 CORRELATION OF MEASUREMENT OF SMALL AIRWAYS INDICES IN A POPULATION OF FIREFIGHTERS

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10.1136/thorax-2021-BTSabstracts.48

Background Small airways damage is a plausible response to fire smoke inhalation. In the UK, periodic respiratory health surveillance is carried out using spirometry. Previous studies have suggested the use of impulse oscillometry (IOS) may identify small airways dysfunction in firefighters even in the context of normal spirometry values and it is hypothesised that this may predict future development of asthma or COPD.
Methods We measured pre and post-bronchodilator spirometry and IOS using ERS/ATS guidelines on the first 203 individuals recruited to a cohort study of firefighters (Grenfell Firefighter Study). We defined significant bronchodilator response as an improvement in forced expiratory volume in one second (FEV1) of 12% and 200mls following administration of inhaled bronchodilator. We also collected information on smoking and self-reported breathlessness using the Dyspnoea-12 questionnaire (maximum score of 36) and explored correlations between different measurements of small airways function.
Results The majority of individuals were male, with a mean age of 45 years; 140 (69%) had never smoked and 12 (6%) had a more than 20 pack year history of smoking. Overall, 32 (16%) had a history of asthma (ever), 15 (8%) had evidence of significant bronchodilator reversibility and 3 (2%) were taking asthma treatment. The majority (73%) reported no breathless (Dyspnoea-12 score of zero). The mean percentage predicted pre-bronchodilator FEV1, forced vital capacity (FVC) and forced expiratory flow at 25–75% of FVC (FEF25–75) were 98%, 102% and 92% respectively using GLI reference equations. The correlation between FEF25–75 and frequency dependence of resistance (R5-R20) was -0.22 (-0.35 to -0.08).
Conclusion We have measured high quality lung function on over 200 firefighters. Further work will be carried out on a larger population of firefighters to explore correlations between spirometry and other measures of small airways indices obtained using IOS to determine if small airways abnormalities are associated with age, sex, smoking and the presence of asthma or self-reported breathlessness. In the future, IOS may prove a useful tool to measure response to occupational fire smoke inhalation.

Abstract S42 Table 1 Demographics, respiratory symptoms and lung function

Variable n (%)	Pre bronchodilator	Post bronchodilator
N	203	
Male	194 (95.6)	-
Age (mean (SD))	45.2 (7.5)	-
Ethnicity (white)	183 (90.2)	-
Duration of employment as firefighter (y)	19.2 (7.2)	-
Smoking history Ex Current	 54 (26.6) 9 (4.4)	-
Body Mass Index (mean (SD))	28.2 (3.79)	-
Diagnosis of asthma (ever)	32 (15.8)	-
Taking current treatment for asthma	3 (1.5)	-
Dyspnoea-12 score 0 1-12 13-36	 148 (72.9) 50 (24.6) 5 (2.5)	
FEV1 L % predicted (mean (SD))	3.99 (0.58) 97.8 (11.1)	4.15 (0.60)* 101.8 (10.6)*
FVC L % predicted (mean (SD))	5.22 (0.80) 101.8 (11.3)	5.22 (0.80)* 101.9 (11.3)*
FEF25-75 L/min % predicted	3.5 (1.0)** 92.0 (25.4)**	4.1 (1.0)*** 106.3 (25.6)***
R5	0.34 (0.09)	0.30 (0.08)
R20	0.30 (0.06)	0.27 (0.05)
R5-20	0.04 (0.05)	0.03 (0.04)
AX	0.18 (0.11, 0.35)	0.13 (0.07, 0.24)
FRes	10.5 (8.5, 13.9)	9.54 (7.89, 12.38)

* n=197; **n=200; *** n=196

S43 REPEATABILITY OF IMPULSE OSCILLOMETRY IN PATIENTS WITH SEVERE ASTHMA

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Introduction Impulse oscillometry (IOS) has advantages over spirometry especially where accurate forced volumetric measurements may be difficult. The coefficient of variation (CV) is commonly used as a measure of precision and repeatability and can also be utilised to assess variability between different devices that perform similar tasks irrespective of units of measurement. Biological variability (BV), a measurement of natural fluctuation, is calculated as the within subject one sided 97.5% CI. Its value can be used as a surrogate for the minimal change that must be exceeded for a clinically significant treatment effect to occur.
Aim To assess the medium term within subject CVs and BVs for IOS (Jaeger Masterscreen) and spirometry.
Methods Data on 42 poorly controlled severe asthma patients attending clinic who underwent no change in treatment between two timepoints (T1 and T2) were retrospectively evaluated.
Results The mean baseline demographic data were as follows: gender (F/M) 27/15; age 53 years; $FEV_1$87%; FEF_{25-75}51%; R5 158%; ACQ 2.1; 4 exacerbations requiring OCS in past year; mean BDP equivalent ICS dose of 1850µg and mean duration between T1 vs T2 11 months. No significant differences were detected for spirometry, IOS and ACQ between T1 and T2. Table 1 depicts the mean within subject% changes with two-sided 95%CI, CVs with two-sided 95%CI and BVs with one sided 97.5%CI. The within subject BV in ACQ was 0.6 units which is similar to the conventional MCID value of 0.5. Thus, BV values for spirometry and IOS could perhaps be interpreted as the change required for a clinically

Abstract S43 Table 1 Mean within subject% change, coefficient of variation and biological variability in pulmonary function between timepoints

	Mean% change (95% CI)	Mean CV (95% CI)	Biological Variability (97.5% CI)
FEV_1	4% (-2 – 10.1)	10.1% (6.7 – 13.5)	0.15 L
$FEF_{25–75}$	6.9% (-5.2 - 19)	20.3% (14.1 – 26.5)	0.21 L/s
FVC	3.3% (-0.8 – 7.1)	6.9% (4.6 – 9.2)	0.15 L
R5	-1.8% (-12.7 – 10.9)	16.1% (11.6 – 20.6)	0.07 kPa/L/s
R20	4.8% (-2.4 – 11.9)	12.5% (9.2 – 15.8)	0.03 kPa/L/s
AX	-12.2% (-39.6 – 15.8)	39.2% (28.9 – 49.6)	0.39 kPa/L
F_{res}	-0.6% (-9.1 – 7.9)	14% (9.4 – 18.5)	1.5 Hz

AX = area under the reactance curve; F_{res} = resonance frequency; R5 = resistance at 5Hz; R20 = resistance at 20Hz; Within subject biological variability was calculated as a one-sided 97.5%CI. Other 95%CI were two-sided.

meaningful response in severe asthma patients. Hence for AX a change ≥0.39 kPa/L is required to represent a clinically meaningful response.

Conclusion In conclusion, we report on medium term repeatability for IOS and spirometry and propose values for within subject biological variability in patients with poorly controlled severe asthma.

S44 BRONCHODILATOR RESPONSE FOR AIRWAY OSCILLOMETRY IN SEVERE EOSINOPHILIC ASTHMA

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10.1136/thorax-2021-BTSabstracts.50

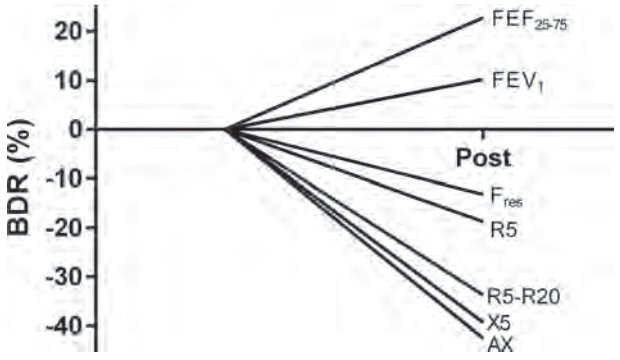
Introduction Bronchodilator response (BDR) is conventionally defined as a 200ml or 12% improvement in FEV_1. In mild to moderate asthma, forced oscillation technique (FOT) BDR is closely related to asthma control.[1] FOT BDR in patients with severe eosinophilic asthma (SEA) is however unknown.

Aim To determine relative BDR for spirometry and airway oscillometry (AOS,Thorasys Tremoflo) in SEA.

Methods Preliminary baseline data from a prospective study (EudraCT No. 2019-003763-22) are presented on SEA patients in response to 400µg salbutamol.

Results Mean values were age 52, $FEV_1$74%, FEF_{25-75}41%, R5 184%, ACQ 2.9, Eosinophils 576 cells/µl, FeNO 54ppb and BDP equivalent ICS dose 1809µg.

Mean absolute changes were: $FEV_1$0.202 L (p<0.001); FEF_{25-75}0.308 L/s (p<0.001); resistance at 5Hz R5 0.12 kPa/L/s (p=0.001); peripheral airway resistance between 5 and 20Hz R5-R20 0.08 kPa/L/s (p=0.005); reactance at 5Hz X5 0.19 kPa/L/s (p=0.011); reactance area AX 2.07 kPa/L (p=0.016) and resonant frequency F_{res}3.17 Hz (p=0.034). The relative% BDR improvements were greatest for R5-R20, X5 and AX reflecting small airways (figure 1). The standardised response mean (SRM) expresses the signal to noise ratio as mean change divided by SD which were: FEV_1 2.02; FEF_{25-75} 1.6; R5 1.36; R5-R20 1.06; AX 0.87 and F_{res} 0.93 (SRM ≥0.80 are considered highly sensitive).



Abstract S44 Figure 1

Conclusion The relative% BDR was greater for AOS than spirometry, although conversely the SRMs were better for spirometry than AOS.

REFERENCE

1. Kuo CR, Chan R, Lipworth B. Impulse oscillometry bronchodilator response and asthma control. *J Allergy Clin Immunol Pract*. 2020;**8**(10):3610-2.

S45 A PUFF OF SUGAR AND A PINCH OF (SPEECH & LANGUAGE THERAPY) SALT: IS THE MANNITOL CHALLENGE TEST A USEFUL INGREDIENT IN THE ASSESSMENT OF INDUCIBLE LARYNGEAL OBSTRUCTION?

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10.1136/thorax-2021-BTSabstracts.51

Introduction In our Tertiary Airways service, we assess for contributors of complex breathlessness, such as asthma and inducible laryngeal obstruction (ILO). Tey et al (2017) studied inhaled mannitol for investigation of laryngeal and bronchial hyper-responsiveness, and concluded inhaled mannitol can be used to induce ILO. Previous studies found abnormalities of the inspiratory flow volume loop (FVL) can indicate need for further investigation of ILO.

Objectives To assess if mannitol challenge testing (MCT) is a useful adjunct in the assessment of ILO, and to measure inter-rater reliability between professionals.

Methods We reviewed 41 consecutive patient records undergoing both MCT and laryngoscopy (undertaken separately) over 15 months. An "upshift" of inspiratory FVL between baseline and maximal dose of inhaled mannitol was taken as indicative of provoking ILO. Ratings of the inspiratory FVL were conducted independently by two speech and language therapists (SLT 1 and 2), a consultant physician and a Respiratory physiologist.

Results Of 41 patients, 25 (61%) had confirmed diagnosis of ILO. Agreement between laryngoscopic diagnosis of ILO and rating of the inspiratory FVL following MCT varied between raters. FVL ratings by SLT 1 agreed with laryngoscopy results 31 times (80%), compared to 27 (68%) agreements by SLT 2, 22 (59%) by the physician and 20 (54%) by the physiologist.

Kappa statistics showed moderate agreement between laryngoscopy and FVL for SLT 1 (k=.55), but weak agreement for SLT 2 (k=.34) and no agreement for the physician or physiologist.

A binary logistic regression assessed the relationship between laryngoscopy outcome and FVL ratings by SLT 1. The model was significant (χ^2 = 12.44 (1, N=41) p=.002) indicating that FVL predicted laryngoscopy outcome, and explained between 24% and 33% of the variance.

Conclusions In assessment for causation of breathlessness, observations of the inspiratory arm of the FVL during MCT may provide clues to the experienced clinician. MCT has potential to be a useful adjunct in the assessment for ILO. However, due to poor inter-rater reliability, further studies are needed to improve our understanding.

Further prospective studies are needed, ideally with MCT and concurrent laryngoscopy to further investigate the utility in assessment for ILO.

S46 LUNG FUNCTION AND PULMONARY SYMPTOMS IN CLASSICAL AND LATE-ONSET FABRY DISEASE

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10.1136/thorax-2021-BTSabstracts.52

Background Fabry Disease (FD) is an X-linked condition resulting from an absolute or relative deficiency of the enzyme alpha-galactosidase A (GLA) leading to a multi-system disorder. FD can be divided into: 1) severe, classical phenotype, most often seen in men; 2) milder late-onset phenotype. While the natural course of classical and late-onset FD has been investigated with regards to cardiac, renal and cerebral manifestations, data concerning pulmonary involvement are limited. This study investigated lung function and symptomatic differences between classical and late-onset FD.

Methods Unselected patients attending Royal Free Hospital, a UK specialist unit for FD, were recruited to a prospective observational study. Baseline demographics and symptom burden were recorded, and all patients underwent lung function testing. Patients were divided into classical and late-onset FD based on the Mount Sinai international FD database. Where this was not possible the lead clinician assessed the phenotype.

Results Forty-five FD patients (20 males, 25 females) were recruited with no baseline differences in age, ethnicity, BMI and smoking history. 73% (33/45) were classical (39% male, 61% female) with 27% late-onset (58% male, 42% female) phenotype. 44% of FD patients had evidence of airway obstruction based on FEV1/FVC <0.7. As classical FD women resemble late-onset males in their disease pattern we compared classical men and the combined group of late-onset men and all women (table 1). Although the latter group were significantly older, there were no significant differences in age-adjusted lung function. The combined group reported increased breathlessness on exertion (SOBOE) (59% vs. 23%, p=0.03). However, in subjects with FEV1/FVC <0.7 no significant difference in SOBOE were identified (64% vs. 22%, p=0.09).

Abstract S46 Table 1 Phenotypic characterisation with regards to lung function and symptoms

	Classic Men	Late-onset men and all females (Combined Data)	P Value
N	**13**	**32**	-
Age	39 ± 11	49 ± 15	**0.03**
Lung function (% predicted)			
FEV1	85 ± 10	92 ± 12	0.08
FVC	100 ± 9	106 ± 13	0.11
FEV1/FVC	70 ± 7	73 ± 8	0.26
MEF50	53 ± 14	60 ± 19	0.25
TLCO	90 ± 15	88 ± 21	0.66
KCO	102 ± 17	94 ± 12	0.08
Symptoms			
SOBOE (%)	23%	59%	**0.03**
Cough (%)	46%	41%	0.73
Wheeze (%)	31%	34%	0.82

All data parametric, mean ± SD presented
SOBOE = Shortness of breath on exertion

Conclusion This study confirms a high prevalence of airway obstruction in FD, with no difference between classical men and our combined group. This appears to be generally mild disease, and does not fully explain the greater frequency of patient-reported breathlessness identified in the combined group. Whilst older age appears relevant, it may also reflect other factors such as concomitant cardiac disease.

REFERENCE

1. Franzen DP, *et al*. *PloS one*. 2017;**12**(suppl 7):e0180437.

S47 HARD TO SWALLOW; INCIDENCE OF OROPHARYNGEAL DYSPHAGIA IN INDUCIBLE LARYNGEAL OBSTRUCTION (ILO)

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10.1136/thorax-2021-BTSabstracts.53

Introduction Patients diagnosed with ILO may report clinical respiratory symptoms including dyspnoea, inspiratory wheeze and cough (RCSLT 2021). Symptoms indicative of dysphagia (swallowing difficulties) and dysphonia (voice difficulties) have also been reported within this population (Hull et al 2016).

In clinical practice, altered laryngeal sensitivity has been seen in association with patient-reported dysphagia symptoms, in the absence of a mechanical swallowing difficulty.

Aims and Objectives To explore the incidence of reported dysphagia symptoms in patients with a confirmed diagnosis of ILO, and to investigate how many patients were diagnosed with a mechanical oropharyngeal dysphagia. Associated patient co-morbidities were also reviewed.

Methods A retrospective review across a 2 year period (April 2019–2021) was conducted for patients who had been referred through to a Tertiary Airways service, seen for assessment by an SLT and had a confirmed ILO diagnosis via provocation laryngoscopy (N=160).

Results Of the 160 patients, 52% (N =82) reported symptoms in keeping with oropharyngeal dysphagia. 27% (N= 22) of these patients had a clinical bedside swallow assessment by a dysphagia trained SLT. Of these patients, 50% (N=11) went on to have an instrumental assessment in the form of Videofluoroscopy (VFS) or Fibreoptic Endoscopic Evaluation of Swallowing (FEES).

Mechanical oropharyngeal dysphagia, resulting in diet and/or fluid modification, was identified in only 2 patients. Of those not formally assessed following case history, typical symptoms reported were in keeping with altered laryngeal sensitivity with no indications of aspiration.

At initial consultation, 8 patients were self-modifying their diet. Other relevant co-morbidities included reflux (71%) and dysphonia (77%).

Conclusions A high proportion of patients (52%) with diagnosed ILO reported symptoms suggesting oropharyngeal

dysphagia. Of these patients only 2.4% (n=2) were found to have oropharyngeal dysphagia on clinical assessment.

This preliminary study emphasises the importance of the SLT role within the Multi-Disciplinary Team; to identify whether these symptoms warrant further assessment. This study also highlights the benefits of access to instrumental assessment to prevent patient morbidity and inform diagnostic management.

Further prospective studies with larger patient cohorts may help to understand patient-reported symptoms of dysphagia further, and continue to inform clinical decision-making.

Developing treatments for COVID-19

S48 LENZILUMAB EFFICACY AND SAFETY IN NEWLY HOSPITALIZED COVID-19 SUBJECTS: RESULTS FROM THE LIVE-AIR PHASE 3 RANDOMIZED DOUBLE-BLIND PLACEBO-CONTROLLED TRIAL

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10.1136/thorax-2021-BTSabstracts.54

Background Severe COVID-19 pneumonia results from a hyperinflammatory immune response (cytokine storm, CS), characterized by GM-CSF mediated activation and trafficking of myeloid cells, leading to elevations of downstream inflammatory chemokines (MCP-1, IL-8, IP-10) and cytokines (IL-6, IL-1). CS leads to fever, hypotension, coagulopathy, respiratory failure, ARDS, and death. Lenzilumab is a novel Humaneered® anti-human GM-CSF monoclonal antibody that binds GM-CSF and prevents signaling through its receptor. The LIVE-AIR Phase 3 randomized, double-blind, placebo-controlled trial investigated the efficacy and safety of lenzilumab to improve the likelihood of ventilator-free survival (referred to herein as survival without ventilation, SWOV), beyond standard supportive care, in hospitalized subjects with severe COVID-19.

Methods Subjects with COVID-19 (n=520), ≥18 years, and ≤94% oxygen saturation on room air and/or requiring supplemental oxygen, but not invasive mechanical ventilation, were randomized to receive lenzilumab (600 mg, n=261) or placebo (n=259) via three intravenous infusions administered 8 hours apart. Subjects were followed through Day 28 following treatment.

Results Baseline demographics were comparable between the two treatment groups: male, 64.7%; mean age, 60.5 years; mean BMI, 32.5 kg/m^2; median CRP, 79 mg/L; CRP was <150 mg/L in 78% of subjects. The most common comorbidities were hypertension (65.6%), obesity (55.1%), diabetes (53.4%), chronic kidney disease (14.0%), and coronary artery disease (13.6%). Subjects received steroids (93.7%), remdesivir (72.4%), or both (69.1%). Lenzilumab improved the likelihood of SWOV by 54% in the mITT population (HR: 1.54; 95%CI: 1.02–2.32, p=0.0403). SWOV also relatively improved by 92% in the predefined subgroup of subjects who received both corticosteroids and remdesivir (1.92; 1.20–3.07; nominal p=0.0067). A key secondary endpoint of incidence of IMV, ECMO or death was also improved in patients receiving remdesivir (p=0.020) or remdesivir and corticosteroids (p=0.0180). Serious adverse events were reported in 24.7% and 29.6% of the lenzilumab and placebo patients, respectively. Compared with placebo, lenzilumab produced no infusion-related reactions, and no attributable serious adverse events; including, hematologic or liver enzyme abnormalities, pulmonary alveolar proteinosis, or increased incidence of infection.

Conclusion Lenzilumab significantly improved SWOV in hypoxic COVID-19 patients upon hospitalization, with the greatest benefit observed in patients receiving treatment with remdesivir and corticosteroids. NCT04351152

S49 C-REACTIVE PROTEIN AS A BIOMARKER FOR IMPROVED EFFICACY OF LENZILUMAB IN COVID-19 PATIENTS: RESULTS FROM THE LIVE-AIR TRIAL

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Background The hyperinflammatory cytokine storm (CS) of COVID-19 is mediated by GM-CSF leading to release of downstream inflammatory chemokines, cytokines, and markers of systemic inflammation (C-reactive protein, CRP). The LIVE-AIR study demonstrated that lenzilumab, an anti-GM-CSF monoclonal antibody in patients hospitalized with COVID-19, safely improved the likelihood of achieving the primary endpoint, survival without ventilation (SWOV) by 1.54-fold (HR: 1.54; 95%CI: 1.02–2.32, p=0.0403) compared with placebo. An exploratory analysis in patients with CRP<150 mg/L and age<85 years was conducted to determine lenzilumab efficacy when administered prior to advanced inflammation.

Methods LIVE-AIR was a phase 3 randomized, double-blind, placebo-controlled trial. Patients with COVID-19 (n=520), ≥18 years, and ≤94% oxygen saturation on room air and/or requiring supplemental oxygen, but not invasive mechanical ventilation (IMV), were randomized to receive lenzilumab (600 mg, n=261) or placebo (n=259) via three intravenous infusions administered 8 hours apart. Participants were followed through Day 28 following treatment.

Results Overall, baseline demographics were comparable between treatment groups: male, 64.7%; mean age, 60.5 years; mean BMI, 32.5 kg/m^2; median CRP, 79 mg/L; CRP was <150 mg/L in 78% of participants. Participants received steroids (93.7%), remdesivir (72.4%), or both (69.1%). Lenzilumab (n=159) improved the likelihood of SWOV by 3.04-fold in participants with CRP<150 mg/L and age<85 years (3.04; 1.68–5.51, nominal p=0.0003) compared with placebo (n=178). Response to lenzilumab was observed in the first through third quartiles of baseline CRP (<41 mg/L, HR:8.33;

41<79 mg/L, HR:1.60; 79<137 mg/L, HR: 2.12; >137 mg/L, HR: 1.17). The incidence of IMV, ECMO, or death was reduced (OR: 0.31; 95%CI: 0.15–0.63, p=0.002) and mortality was improved by 2.22-fold (OR: 2.22; 95%CI: 1.07–4.67, p=0.034). In these participants, lenzilumab decreased CRP as early as Day 2 following treatment, compared with placebo which was further decreased by 38% on Day 28 compared with placebo (24.4±3.4 mg/L vs 39.1±4.9 mg/L).

Conclusion Lenzilumab significantly improved SWOV in hospitalized, hypoxic participants with COVID-19 pneumonia with the greatest benefits in SWOV and survival in patients with CRP<150 mg/L and age <85 years. Inhibition of GM-CSF, an orchestrator of CS, early in the hyperinflammatory response improved outcomes in COVID-19. NCT04351152

S50 A RANDOMISED CLINICAL TRIAL OF AZITHROMYCIN VERSUS STANDARD CARE IN AMBULATORY COVID-19 – THE ATOMIC2 TRIAL

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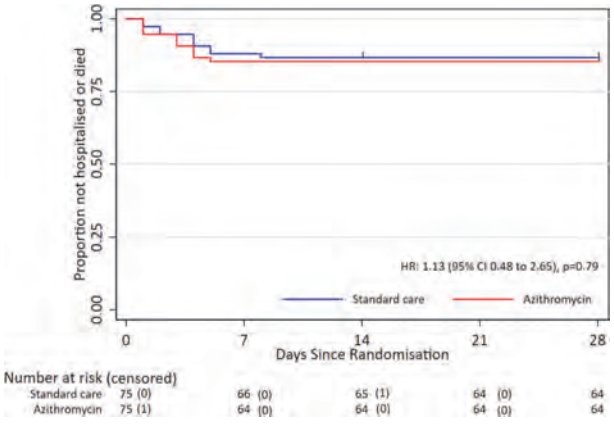
Background The antibacterial, anti-inflammatory and antiviral properties of azithromycin suggest therapeutic potential against COVID-19. Randomised data in mild-moderate disease are lacking. We assessed whether azithromycin is effective in reducing hospitalisation in patients with mild-moderate COVID-19.

Methods This open-label, randomised superiority clinical trial at 19 centres in the United Kingdom enrolled adults, ≥18 years, presenting to hospitals with clinically-diagnosed highly-probable or confirmed COVID-19 infection, with <14 days symptoms, considered suitable for initial ambulatory management. Patients were randomised (1:1) to azithromycin (500 mg daily orally for 14 days) or to standard care without macrolides. The primary outcome was the difference in proportion of participants with death or hospital admission from any cause over the 28 days from randomisation, assessed according to intention-to-treat (ITT). Trial registration: ClinicalTrials.gov, NCT04381962, Study closed.

Results 298 participants were enrolled from 3rd June 2020 to 29th January 2021. The primary outcome was assessed in 292 participants. The primary endpoint was not significantly different between the azithromycin and control groups (Adjusted OR 0·91 [95% CI 0·43–1·92], p=0·80).

Conclusions In patients with mild-moderate COVID-19 managed without hospital admission, adding azithromycin to standard care treatment did not reduce the risk of subsequent hospitalisation or death. Our findings do not support the use of azithromycin in patients with mild-moderate COVID-19.



Abstract S50 Figure 1 Kaplan-Meier plot of time to hospitalisation in the ITT +ve population

S51 EVALUATION OF TREATMENT APPROACHES FOR HOSPITALIZED COVID-19 PATIENTS

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10.1136/thorax-2021-BTSabstracts.57

Background COVID-19 has driven innovation leading to emergency use authorization of treatments that address its urgent healthcare needs. However, physicians, payers and healthcare systems are challenged to select among these novel treatments for both effectiveness and value. Reliance on change in relative, rather than absolute, risk often makes discrimination of treatment effects between medications impractical, with potentially misleading conclusions. Number Needed to Treat (NNT), the reciprocal of the Absolute Risk Reduction, can be a valuable alternative in assessing benefit:risk. The objective of the current analysis was to calculate NNT for reported endpoints of COVID-19 treatments.

Methods Clinical information was captured from published literature and pre-prints from investigations of COVID-19 treatments. NNTs were calculated for reported endpoints. Outpatient treatments to reduce viral load included neutralizing antibody 'cocktails' REGN-COV2[1] and bamlanivimab/etesevimab.[2] Inpatient treatments included the anti-viral: remdesivir [3,4]; and immune modulators: baricitinib[5], and lenzilumab.[6]

Results REGN-COV2 reduced the number of medically attended visits with NNT of 33.3. The NNT for hospitalization or death was 20 for bamlanivimab/etesevimab. NNTs for 28-day mortality with inpatient treatment were 37 for baricitinib, 26.3 for remdesivir alone, and 22.7 for lenzilumab. Additional analyses of lenzilumab resulted in NNT of 14.7 when combined with remdesivir and corticosteroids, 15.4 when combined with remdesivir, and 13.9 in patients with baseline CRP<150mg/L and age<85 years. The NNT for lenzilumab to prevent survival without ventilation (SWOV) was 15.4 which, decreased to 6.4 in patients with baseline CRP<150mg/L and age<85 years. The number needed to prevent a serious adverse event was 20 for baricitinib, 15 for remdesivir, and 20.4 for lenzilumab.

Conclusion The NNT for COVID-19 treatments varied with setting, endpoint, and mechanism. The NNT for lenzilumab improved with refinement of concomitant medications and patient phenotype. NNT provides a simple measure for comparative analyses that helps inform clinical decision-making and resource allocation.

REFERENCES

1. Weinreich, *et al. N Engl J Med* 2021;**384**:238–51.

2. Gottlieb, *et al*. *JAMA* 2021;**325**:632–44.
3. Garibaldi, *et al*. *JAMA NetwOpen* 2021;**4**:e213071.
4. Beigel, *et al*. *N Engl J Med* 2020;**383**:1813–26.
5. Kalil, *et al*. *N Engl J Med* 2020.
6. Temesgen, *et al*. *medRxiv* 2021.

S52 CONVENTIONAL OXYGEN THERAPY VERSUS CPAP AS A CEILING OF CARE IN WARD-BASED PATIENTS WITH COVID-19: A MULTI-CENTRE COHORT EVALUATION

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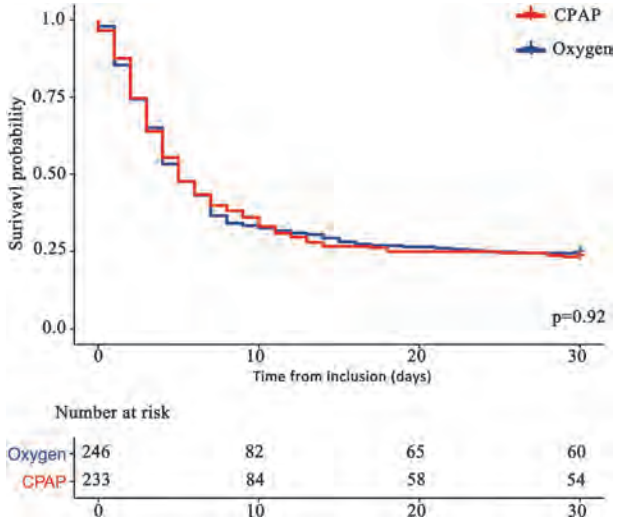
10.1136/thorax-2021-BTSabstracts.58

Background Continuous positive airway pressure (CPAP) therapy is commonly used for respiratory failure due to severe COVID-19 pneumonitis, including in patients deemed unlikely to benefit from invasive mechanical ventilation (nIMV). Little evidence exists demonstrating superiority over conventional oxygen therapy, as acknowledged by current pragmatic guidelines, whilst ward-level delivery of CPAP presents practical challenges. Precedent studies have been limited by small numbers, subjective physician treatment-selection, and lack of a control group. We sought to compare clinical outcomes of oxygen therapy versus CPAP therapy in patients with COVID-19 who were nIMV.

Methods The North West Collaborative Organisation for Respiratory Research (NWCORR), a trainee-led network, performed a retrospective multi-centre cohort evaluation. Patient inclusion criteria were: a clinical diagnosis of COVID-19, a treatment escalation plan of ward-level care, treatment at a hospital only providing one respiratory support strategy and clinical frailty score ≤6. Patients were cohorted according to respiratory support strategy, either being CPAP in accordance with national guidelines or oxygen therapy requiring FiO_2 ≥0.4 for over 12 hours; who would therefore have been eligible for CPAP if treated at a CPAP cohort hospital. Logistic regression modelling, using generalised estimating equations to account for within-hospital clustering, was performed to compare 30-day mortality between treatment groups, accounting for important confounders.

Results Seven hospitals provided data for 479 patients during the UK COVID-19 pandemic in 2020. Overall 30-day mortality was 75.6% in the oxygen group (186/246 patients) and 77.7% in the CPAP group (181/233 patients) (figure 1). A lack of evidence for a treatment effect persisted in the adjusted model (adjusted 30-day mortality odds ratio comparing CPAP to oxygen of 0.84, 95% CI 0.57–1.23, p=0.37). 49.8% of patients receiving CPAP-therapy (118/237) chose to discontinue it.

Discussion This is, as far as we are aware, the first study comparing conventional oxygen therapy with CPAP in cohorts unaffected by physician selection. No survival difference was found between using oxygen alone or CPAP to treat patients with severe COVID-19 who were nIMV. A high patient-initiated discontinuation rate for CPAP suggests a significant treatment burden. Further reflection is warranted on the continued widespread use of CPAP in this patient group.



Abstract S52 Figure 1 Kaplan-Meier curve comparing overall survival in the two treatment groups (conventional oxygen therapy vs continuous positive airway pressure therapy). The null hypothesis of no survival difference is evaluated with a log-rank test (p = 0.92)

Please refer to page A189 for declarations of interest related to this abstract.

S53 IMPACT OF EMPIRICAL ANTIBIOTIC USE IN PATIENTS WITH COVID-19 ON MORBIDITY AND MORTALITY DURING THE FIRST AND SECOND UK SARS-COV-2 WAVES

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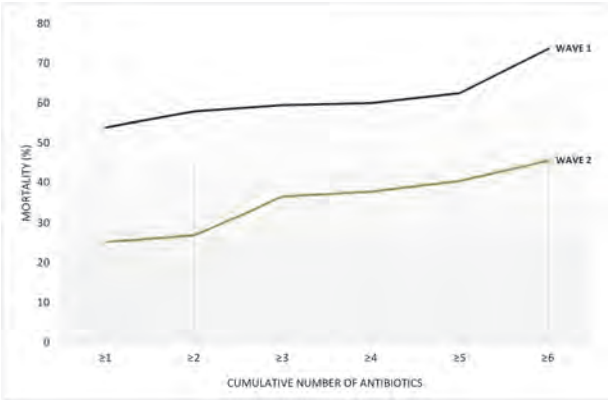
10.1136/thorax-2021-BTSabstracts.59

Background Poor antimicrobial stewardship is frequently observed in COVID-19 patients and relates to greater mortality when empirical antibiotics are administered without compelling evidence of bacterial co-infection.[1] Here, we assess the impact of antibiotic administration in COVID-19 patients on inpatient morbidity and mortality during the first and second UK SARS-CoV-2 waves.

Methods Two representative four-month timeframes of RT-PCR positive COVID-19 admissions to a Greater London District General Hospital were retrospectively analysed, with 481 patients between 15th February 2020 and 15th June 2020 representing the first wave, and 1342 between 1st November 2020 and 28th February 2021 for the second wave. Morbidity was measured by mean length-of-stay. Independent correlation was assessed with multilinear regression analysis adjusting for demographics and comorbidities.

Results 87.9% of first and 86.0% of second wave inpatients received at least one antibiotic, despite only 21.4% and 16.8% showing bacterial culture positivity of a non-contaminant pathogen, respectively. A mean 2.41 and 2.05 antibiotic types were administered per patient during first and second COVID-19 waves. Antibiotic administration was independently



Abstract S53 Figure 1 Rates of mortality against cumulative number of antibiotics received per patient during inpatient spell.

associated with increased inpatient mortality in both the first wave (54.1% mortality for ≥1 antibiotic vs 19.0% receiving no antibiotic, p<0.00001) and second wave (25.2% mortality for ≥1 antibiotic vs 4.3% receiving no antibiotic, p<0.00001). Successive numbers of antibiotics related to progressive worsening of mortality rates in both waves (OR 1.453, p<0.0001). Antibiotic use was also associated with prolonged length-of-stay in the first wave (13.0 ±13.4 days for ≥1 antibiotic vs 6.9 ±12.1 receiving no antibiotic, p=0.0011) and second wave (11.9 ±11.7 days for ≥1 antibiotic vs 6.6 ±10.6 receiving no antibiotic, p=0.00005).

Conclusion In both COVID-19 waves, antibiotic administration correlated to increased inpatient morbidity and mortality. Given a near-linear relationship of mortality and cumulative antibiotic numbers, antimicrobial stewardship is essential, and tapering an appropriate therapy for likely responsible pathogens will yield lower mortality compared to overlapping coverage and inappropriate escalation. We strongly discourage the use of empirical antibiotics without supporting biochemical evidence of bacterial co-infection for possible future COVID-19 waves.

REFERENCE

1. Russell C, et al. *Lancet Microbe*. 2021 Jun 2. https://doi.org/10.1016/S2666-5247(21)00090-2

Understanding COVID-19 mechanisms

S54 ELEVATED NETOSIS AND MIGRATION BUT IMPAIRED ANTI-MICROBIAL RESPONSES IN NEUTROPHILS FROM NON-ICU, HOSPITALIZED COVID-19 PATIENTS

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10.1136/thorax-2021-BTSabstracts.60

Rational Infection with the SARS-CoV2 virus is associated with elevated neutrophil counts. Evidence of neutrophil dysfunction in COVID-19 is based predominantly on transcriptomics or single functional assays. Cell functions are interwoven pathways, and so understanding the effect of COVID-19 across the spectrum of neutrophil function may identify therapeutic targets to treat disease.

Objectives Examine neutrophil phenotype and functional capacity in COVID-19 patients versus age-matched controls (AMC).

Methods Isolated neutrophils from 41 non-ICU COVID-19 patients and 23 AMC underwent *ex vivo* analyses for migration, phagocytosis of *Streptococcus pneumoniae*, reactive oxygen species (ROS) generation, neutrophil extracellular trap formation (NETosis) and cell surface receptor expression. Serum DNAse 1 activity was measured, alongside circulating levels of cell-free (cf)DNA, myeloperoxidase (MPO), VEGF, IL-6 and sTNFRI. All measurements were correlated to clinical outcome. Serial sampling on day 3–5 post hospitalisation were also measured.

Results Compared to AMC, COVID-19 neutrophils demonstrated elevated transmigration (p=0.0397) and NETosis (p=0.0366), but impaired phagocytosis (p=0.0236) associated with impaired ROS generation (p<0.0001). Surface expression of CD54 (p<0.0001) and CD11c (p=0.0008) was significantly increased and CD11b significantly decreased (p=0.0229) on COVID-19 patient neutrophils. On day 3–5 follow-up, levels of senescent neutrophils increased compared to day 1 (indicated by decreased CXCR2 and elevated CXCR4 expression (p=0.0332)). COVID-19 patients showed increased systemic markers of NETosis including increased cfDNA (p=0.0153) and impaired DNAse activity (p<0.0.001). MPO, VEGF, sTNFRI, and IL-6 (p<0001) were elevated in COVID-19, which positively correlated with disease severity by 4C score.

Conclusion COVID-19 is associated with neutrophil dysfunction across all main effector functions, with altered phenotype, elevated migration, impaired antimicrobial responses and elevated NETosis. These changes represent a clear mechanism for tissue damage and highlight that targeting neutrophil function may help modulate COVID-19 severity.

Please refer to page A189 for declarations of interest related to this abstract.

S55 PERSISTENT CHANGES TO THE NASAL CILIATED EPITHELIUM FOLLOWING SARS-COV2 INFECTION: A LONGITUDINAL COHORT ANALYSIS FROM FOLLOW-COVID

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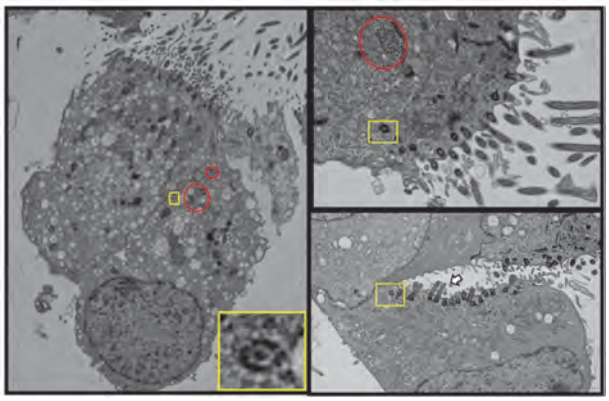
10.1136/thorax-2021-BTSabstracts.61

Background SARS-CoV2 binds to the respiratory epithelium. Little is known about the recovery and regeneration of the epithelium following COVID-19. Poor recovery could leave individuals at risk of secondary bacterial infection and persistent symptoms.

The aim of this study was to assess epithelial recovery following SARS-CoV2 infection across a range of acute illness severities.

Methods 41 people were recruited at 3–12 months post PCR confirmed SARS-CoV2 infection. The respiratory epithelium was sampled by brushing the nasal inferior turbinate. Ciliary function was assessed by high-speed video microscopy and ultrastructure was assessed by electron microscopy. A subset of patients had repeat nasal brushing 3–5 months following their first visit. Demographics, severity of infection and longitudinal symptoms were recorded for comparison. Results were compared to healthy controls and historical controls recruited prior to the pandemic.

Results Post-COVID epithelium was friable and most samples contained detached single cells and blood. Epithelial disruption



Abstract S55 Figure 1 Transmission Electron Micrographs of ciliated epithelial cells 3months- 1 year post-COVID. Red circles represent microtubular subunits assembling during ciliogenesis, the white arrow shows short regenerating cilia. Yellow boxes surround intracytoplasmic cilia seen in 90% post COVID cases and suggestive of a defect in ciliogenesis

score was 3.0 ±0.6 compared to 2.4 ±0.6 for controls (p<0.01). Percentage of goblet cells in post-COVID patients and controls was similar, but there was a significant lack of ciliation of the epithelium post-COVID (p<0.01). No significant improvement was seen In 14 patients with a second sampling point3–5 months later. Ultrastructural analysis revealed evidence of regeneration of ciliated epithelial cells such as the presence of microtubular subunits and basal bodies in the cytoplasm as well as shortened cilia (figure 1).

Ciliary beat amplitude per second was significantly reduced compared to controls (60.2 ±19.2µm/s vs 78.5 ±8.9µm/s) (p<0.0001). 29% individuals post-COVID had some rotating cilia, usually a specific sign for Primary Ciliary Dyskinesia. Ultrastructural analysis revealed 17%(±11%) cilia had defects, these included defects of the central pair of microtubules, in keeping with a rotational beat pattern. 90% cases had cells with intracytoplasmic cilia, suggestive of epithelial inflammation and dysfunctional ciliogenesis. This was seen in <1% controls.

No significant difference was seen between community, hospitalised, or critical care cases.

Conclusion Epithelial disruption and defects in epithelial regeneration persist for up to 1 year post infection with SARS-CoV-2, irrespective of initial illness severity. Persisting inflammation, or a failure of repair, are possible pathological processes for further exploration.

S56 MEASURES OF INFLAMMATION, COMPLEMENT ACTIVATION AND COAGULATION IN PATIENTS WITH COVID-19

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10.1136/thorax-2021-BTSabstracts.62

Introduction Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) has resulted in a global pandemic of unprecedented magnitude causing a disease that varies widely in nature and severity ranging from asymptomatic carriers to life-threatening illness requiring ICU support. Excessive immune activation is believed to underpin the pathophysiology, however, despite the identification of treatments which target this (Dexamethasone, Tocilizumab) there remains significant morbidity and mortality suggesting other pathobiological mechanisms are at play including the complement cascade.

Methods We compared the clinical, physiological & biological characteristics including levels of inflammation, complement activation and coagulation of 52 patients with confirmed or clinically suspected COVID-19, stratified based on their degree of respiratory failure (Mild: FiO2≤0.4; Moderate: FiO2>0.4 ± NIV support (HFNO/CPAP) or Severe: mechanical ventilation) and compared to 20 age and co-morbidity matched

Abstract S56 Table 1 Table to show measures of complement activation, inflammation and coagulation in patients with COVID-19 stratified by disease severity

	Mild	Moderate	Severe	Overall P-Value	Mild vs Mod*	Mild vs Sev*	Mod vs Sev*
Number (%)	30	28	9	-	-	-	-
CRP (mg/L)	75.5 [28.5,117.25]	93.5 [72,143.5]	60 [34,157.5]	NS	NS	NS	NS
Ferritin (ug/L)	426 [290.5,847.5]	728 [381.25,1071.5]	857 [443,1607.5]	NS	NS	NS	NS
PCT (ug/L)	0.08 [0.06,0.19]	0.16 [0.09,0.49]	0.19 [0.12,0.8]	0.019	NS	0.046	NS
LDH (U/L)	708.5 [523.5,903]	830 [569,1122]	1037 [927.5,1086]	0.008	NS	0.006	NS
Platelets (10*9/L)	220 [174.75,328.75]	255 [203.5, 335]	292 [209.5, 329.5]	NS	NS	NS	NS
INR	1.1 [1.08,1.23]	1.1 [1.1, 1.2]	1.1 [1.1, 1.15]	NS	NS	NS	NS
APTR	0.9 [0.9,1.0]	0.9 [0.9, 1.0]	1.0 [0.95, 1.10]	NS	NS	NS	0.038
D-dimer (ugFEU/ml)	0.56 [0.38,0.95]	0.74 [0.55, 1.52]	0.85 [0.54, 19.2]	NS	NS	NS	NS
Fibrinogen (g/L)	4.45 [4.05,5.22]	4.7 [4.3, 6.38]	4.3 [3.9, 6.0]	NS	NS	NS	NS
Thrombin-AT III Complex ug/L)	4.75 [2.65,12.13]	8.8 [5.3, 12]	14.3 [6.9, 40.7]	0.045	NS	NS	NS
Prothrombin Fragment 1&2 (pMol/L)	275 [164.5,380.5]	311 [163, 492]	301 [258, 709]	NS	NS	NS	NS
CH50 (U Eq/ml)	123.4 [101.75,174.7]	113.4[88.68, 153.43]	114.7 [74.6,158.9]	NS	NS	NS	NS
Complement C5a (ng/ml)	29 [21.5, 36]	36.5[25.5, 48.75]	68 [39.5,122.5]	<0.001	0.038	0.001	NS
Complement C5 (mg/L)	270 [235.25,290.5]	263[235.25, 279]	276 [220,299.5]	NS	NS	NS	NS
Complement C3 (g/L)	1.5 [1.25,1.77]	1.48[1.33, 1.71]	1.56 [1.16,1.73]	NS	NS	NS	NS
SC5b-9 complex (ng/ml)	1070.46 [836.41,1632.17]	1725.48[1092.62, 2403.3]	2392.66 [1245.68,5145.88]	0.006	NS	0.019	NS
Complement Fragment Bb (µg/ml)	0.2[0.15,0.27]	0.25[0.17, 0.3]	0.29 [0.2,0.43]	NS	NS	NS	NS
Complement C3a ng/ml)	296.88[244.33,345.22]	325.88[248.33, 484.03]	460.23 [282.49,652.1]	NS	NS	NS	NS

*P-values given a Bonferroni adjustment to allow for multiple testing between subgroups

volunteers. In the event of deterioration with escalation of severity category repeat samples were obtained.

Results Patients with COVID-19 were more likely to be male (67% vs 20% (HC); p<0.001), older (64.4 ± 16.7 vs 47.7 ± 13.5; p<0.001) have a greater BMI (32.3 ± 6.6 vs 27.9 ± 5.1; p=0.01) and be never-smokers (60% vs 30%; p=0.001). We demonstrated a hyperinflammatory and pro-coagulative state in all patients with COVID-19. All measures of complement activity were significantly higher in patients with COVID-19, including levels of C5a (HC 13[7,21] vs Covid-19 35[24, 43]; p<0.001) and SC5b9-complex (HC 654[419, 1120] vs Covid-19 1452[970, 2170]; p<0.001) which both increased with disease severity and were statistically significantly different between mild and severe disease. SC5b9-complex was significantly higher in patients who deteriorated from moderate to severe disease (1393 [1019, 1986] vs 2116 [958, 4538]; p=0.03).

Discussion Our findings demonstrated increased levels of complement activity in patients with COVID-19, particularly in those patients requiring non-invasive and mechanical ventilation and those patients that deteriorate requiring increasing ventilatory support. The complement cascade is a key player in protective immunity against pathogens, with its activation orchestrating key immunoprotective and anti-inflammatory effects. Increased activation of the complement cascade may contribute to the dysregulated and destructive inflammatory response that leads to multi-organ failure and our findings suggest a potentially important treatment target for COVID-19.

S57 EXPRESSION OF THE SARS-COV-2 RECEPTORS ACE2 AND TMPRSS2 IN THE RESPIRATORY TRACT OF CHILDREN AND ADULTS

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10.1136/thorax-2021-BTSabstracts.63

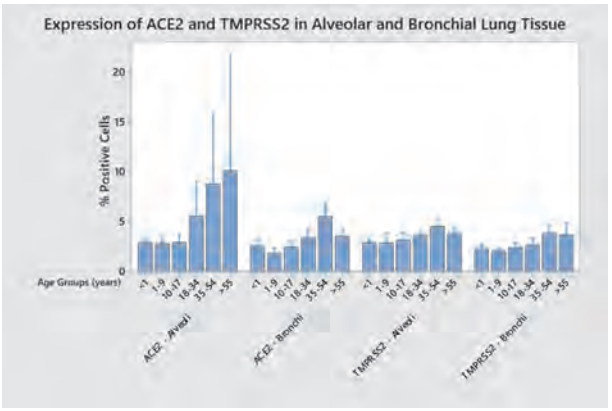
Background Angiotensin-converting enzyme 2 (ACE2) receptors and the serine protease co-factor TMPRSS2 are cellular receptors/co-factors for SARS-CoV2, allowing viral entry into host cells. Children, when infected with SARS-CoV2, generally present with mild disease, and particularly milder lower respiratory tract symptoms. One hypothesis to explain this phenomenon is differential expression of ACE2 and TMPRSS2 in the respiratory tracts of children and adults.

Aims To investigate ACE2 receptor and TMPRSS2 expression in upper/lower respiratory tracts of children and adults without COVID disease.

Methods Nasal brushings from obtained from children of different ages (3 months –15 years) undergoing routine elective surgery, and from volunteer adults (20–61 years). Nasal epithelial ACE2 and TMPRSS2 mRNA expression was analysed by PCR.

Post-mortem lung tissue from children and adults without COVID-19 was stained to identify ACE2 and TMPRSS2 protein expression by immunohistochemistry (IHC). Each sample was digitalised using Philips Digital Pathology Solutions software, with three alveolar and three bronchial screen-grab images obtained at x40 magnification, and analysed using Image J.

Results Nasal ACE2 and TMPRSS2 mRNA expression in children and adolescents (n=12) and adults (n=26) was similar. Immunohistochemical lung tissue ACE2 and TMPRSS2 protein expression in 38 subjects (<1yr n=9, 1–9yrs n=4, 10–17yrs n=6, 18–34yrs n=7, 35–54yrs n=7, >55yrs n=5) was significantly greater in alveolar than bronchial sections. In children, ACE2 and TMPRSS2 expression was detected in only 2–3% of cells in alveolar and bronchial tissue. Alveolar ACE2 receptor expression was significantly greater in adults and appeared to increase with age. Adult alveolar ACE2 receptor expression was highly variable, being detected in some specimens in ~30% of cells.



Abstract S57 Figure 1 Bar chart with error bars displaying mean% positive cells for each age group for alveolar and bronchial ACE2 and TMPRSS2

Conclusion ACE2 and TMPRSS2 expression is similar in upper airways of children and adults, likely indicating that both groups are equally susceptible to SARS-CoV2 infection. In contrast, expression of both these receptors/co-factors is greater in adult lower airways of adults, and particularly for ACE2 receptor in alveolar tissue. In some adults, ACE2 receptor was detected in up to a quarter of alveolar cells, potentially explaining why some adults are so susceptible to lower respiratory tract disease.

Treatment choices in cystic fibrosis and bronchiectasis: what works and when

S58 TRIPLE CFTR MODULATORS IMPROVE SINO-NASAL AND LARYNGOPHARYNGEAL REFLUX SYMPTOMS IN PEOPLE WITH ADVANCED CYSTIC FIBROSIS LUNG DISEASE

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10.1136/thorax-2021-BTSabstracts.64

Background Triple CFTR modulator therapy (elexacaftor/tezacaftor/ivacaftor) improves lung function, weight, exacerbation rates and quality of life in people with Cystic Fibrosis. CF is a multisystem disease and there is increasing interest in the extrapulmonary effects of CFTR modulators. Chronic rhinosinusitis and gastroesophageal reflux are common in people with CF and cause a high level of sino-nasal and laryngopharyngeal symptoms. We assessed the effect of triple CFTR modulator therapy on these symptoms in a cohort of patients with advanced CF lung disease.

Method In a prospective study, we used the Sino-Nasal Outcome Test (SNOT), the Reflux Symptom Index (RSI) and the

Abstract S58 Table 1 Measured values at baseline and after 6 months' treatment.

	Baseline	6 months	Difference
ppFEV1 [1]	24.8 (7.13)	33.4 (10.33)	8.6 [3]
BMI [1]	21.3 (4.13)	23.9 (4.29)	2.6 [3]
RSI [2]	15 (10.75–23)	5 (2.25–7)	10 [3]
HARQ [2]	26.5 (16–39)	7 (3.75–12.25)	19.5 [3]
SNOT-20 [2]	36.5 (22–42)	20 (10–31.25)	16.5 [3]

[1] mean (Standard Deviation)
[2] median (IQR)
[3] p<0.001
ppFEV1 – percentage predicted Forced Expiratory Volume in 1 second, BMI – Body Mass Index, RSI – Reflux Symptom Index, HARQ - Hull Airway Reflux Questionnaire, SNOT-20 - Sino-Nasal Outcome Test 20

Hull Airway Reflux Questionnaire (HARQ) as patient-reported outcome measures (PROMs) to assess the effect of triple CFTR modulators on sino-nasal and laryngoesophageal reflux symptoms. Questionnaires, lung function and weight were recorded at baseline before starting treatment and after 6 months on treatment.

Results 32 patients (23 male) starting elexacaftor/tezacaftor/ivacaftor were studied. Their baseline characteristics were mean age 34.3 (range 20–65) years, FEV_1% predicted 24.8 (11–40), weight 63.2 kg (35–99.8) and BMI 21.28 kg/m^2 (13.2–31.1). All patients continued with treatment throughout the study period. At 6 months there was an improvement in mean FEV1% predicted of 8.63 and BMI 2.6 kg/m^2. Patient reported outcome measures showed significant improvement (table 1): median scores RSI 10, HARQ 19.5 and SNOT 16 (p<0.001 for all outcomes).

Discussion This study shows significant improvement in lung function, weight and sino-nasal and laryngopharyngeal reflux PROMs in patients with advanced CF. The SNOT-20, RSI and HARQ scores showed improvement that exceeded recognised clinically significant changes in these metrics.

S59 ADHERENCE TO NEBULISED THERAPIES IN PEOPLE WITH CYSTIC FIBROSIS STARTING ELEXACAFTOR/TEZACAFTOR/IVACAFTOR (KAFTRIO)

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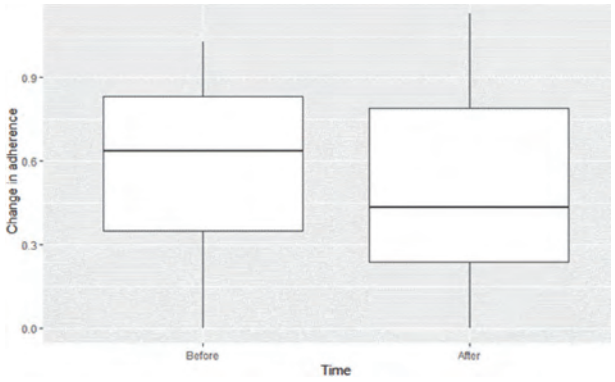
10.1136/thorax-2021-BTSabstracts.65

Introduction Cystic Fibrosis HealthHub (CFHH) is a digital platform in use by 17 adult CF centres in the UK which improves patient self-care by objectively monitoring adherence to nebulised therapies delivered via e-Track nebulisers which record device usage on a central server. This study aimed to objectively measure a perceived decrease in adherence with nebulised therapies following initiation of the Elexacaftor-Tezacaftor-Ivacaftor oral CFTR modulator therapy.

Methods We identified all patients on Kaftrio currently enrolled in CFHH who regularly uploaded data. We compared average CFHH-measured adherence 3 months before and after starting Kaftrio. We reviewed documentation on our clinical database of any patient or healthcare professional decision to change nebuliser usage.

Results 154 patients were taking Kaftrio. 71 were not enrolled in CFHH, 34 did not regularly upload data, and 2 had been instructed to change therapy during the study period leaving 47 patients included in analysis. 31 patients (65%) reduced their adherence to nebulised therapies following Kaftrio use. Median nebulised therapy adherence dropped from 65% to 42% (p<0.003, Wilcoxson Signed Rank) pre and post Kaftrio introduction respectively (figure 1). Of the 47 patients, 28 (60%) communicated a decision to change therapy with the CF team, while 19 (40%) did not communicate this change.



Abstract S59 Figure 1 Box plot comparing average adherence of nebulised therapy before and after Kaftrio initition

Discussion Our data demonstrates a reduction in nebulised therapy adherence after Kaftrio initiation. Decisions to reduce adherence were often patient driven and not disclosed to clinicians.

Our findings underline the importance of including objective measures of adherence to inhaled therapies in the design of CFTR modulator studies.

The lack of CFHH uploads for 34 patients highlights the challenges in monitoring adherence in clinical practice; in our experience, these patients were less adherent to treatment.

We plan to conduct a qualitative study to explore factors influencing patient decisions to stop or continue medication.

S60 OBSERVATIONAL STUDY OF IVACAFTOR IN PEOPLE WITH CYSTIC FIBROSIS AND SELECTED NON-G551D GATING MUTATIONS: FINAL RESULTS FROM VOCAL

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10.1136/thorax-2021-BTSabstracts.66

Introduction and Objectives VOCAL, a Phase 4 observational study (NCT02445053), assessed real-world effectiveness of ivacaftor (IVA) in people with cystic fibrosis (pwCF) with ≥1 non–*G551D* gating mutation (*G178R*, *S549N*, *S549R*, *G551S*, *G1244E*, *S1251N*, *S1255P* or *G1349D*).

Methods PwCF aged ≥6 years in Italy, the Netherlands and the UK who were IVA-naïve or on IVA for ≤18 months at enrolment were eligible. Data were recorded for 12 months pre-IVA and up to 48 months after enrolment. Continuous outcomes (e.g. percent predicted forced expiratory volume in 1 second [$ppFEV_1$], body mass index [BMI]) were assessed from baseline (the last pre-IVA value recorded) in 6-month intervals up to 48 months post-IVA using a mixed model for

repeated measures; total pulmonary exacerbations (PEx) and healthcare resource utilisation (HCRU) post- vs pre-IVA were assessed using a negative binomial model.
Results 65 of 73 (89%) completed the study; mean IVA exposure was 49.5 months (range, 2–64). Mean baseline age was 26.9 years (standard deviation [SD], 13.5). Mean baseline $ppFEV_1$ (64.83 [SD, 23.61]) increased by a least-squares (LS) mean of 10.77 (standard error [SE], 1.28) within 6 months that was sustained up to 48 months (10.27 [SE, 1.45]). Mean baseline BMI (pwCF ≥20 years, n=49; 22.95 kg/m^2 [SD, 3.81]) increased by an LS mean of 0.79 (SE, 0.14) within 6 months and 1.30 (SE, 0.24) at 48 months. Mean baseline BMI *z* score (pwCF <20 years, n=24; −0.41 [SD, 0.89]) increased by an LS mean of 0.54 (SE, 0.11) within 6 months and 0.41 (SE, 0.14) at 48 months. Estimated annualised rates of PEx, PEx requiring hospitalisation, all-cause hospitalisation and PEx requiring acute antibiotics decreased by >50% in the first 12 months post- vs 12 months pre-IVA, and changes were sustained during treatment. No new safety concerns were identified.
Conclusions IVA showed sustained effectiveness in clinical outcomes and decreased HCRU.

Please refer to page A189 for declarations of interest related to this abstract.

S61 RESPIRATORY MICROBIOLOGY OUTCOMES FROM AN OBSERVATIONAL STUDY OF IVACAFTOR IN PEOPLE WITH CYSTIC FIBROSIS AND NON-G551D GATING MUTATIONS (VOCAL)

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10.1136/thorax-2021-BTSabstracts.67

Introduction and Objectives Certain respiratory pathogens are associated with reduced lung function and disease progression in people with cystic fibrosis (pwCF). We report respiratory microbiology results from a Phase 4 observational study (NCT02445053) assessing real-world effectiveness of ivacaftor (IVA) in pwCF with non-*G551D* gating mutations (*G178R*, *S549N*, *S549R*, *G551S*, *G1244E*, *S1251N*, *S1255P* or *G1349D*).
Methods PwCF aged ≥6 years in Italy, the Netherlands and the UK who were IVA-naïve or on IVA for ≤18 months at enrolment were eligible. Data were recorded for 12 months pre-IVA and up to 48 months after enrolment. Microbiology cultures were taken via sputum, throat or oropharyngeal swabs.
Results 65 of 73 (89%) completed the study; mean IVA exposure was 49.5 months (range, 2–64). Mean (standard deviation) baseline age and percent predicted forced expiratory volume in 1 second were 26.9 (13.5) years and 64.83 (23.61), respectively. In the 12 months pre-IVA, 279 cultures were obtained from 69 pwCF and 182 cultures in 64 pwCF at year 4 following IVA treatment. Prevalence of *P. aeruginosa*, *A. fumigatus* and *S. maltophilia* was 55.1%, 30.4% and 11.6%, respectively, in the 12 months pre-IVA and was reduced to 52.9%, 18.6% and 7.1% in year 1 and 41.5%, 16.9% and 4.6% in year 2 on IVA. Sustained or further reductions were observed through 48 months of treatment. Prevalence of other pathogens was variable or too low to evaluate. 70% of pwCF were on chronic oral and/or inhaled antibiotics pre-IVA vs 68% at 48 months. Use of other chronic inhaled therapies was stable throughout the study.
Conclusions Lower prevalence of *P. aeruginosa*, *A. fumigatus* and *S. maltophilia* was observed with prolonged IVA treatment for up to 48 months in real-world settings. Chronic medication use remained stable.

Please refer to page A189 for declarations of interest related to this abstract.

S62 THE MICROBIOLOGY OF BRONCHIECTASIS EXACERBATIONS IN THE UK EMBARC REGISTRY AND IMPLICATIONS FOR PRESCRIBING IN PRIMARY CARE: A COHORT STUDY

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10.1136/thorax-2021-BTSabstracts.68

Introduction The British Thoracic Society (BTS) guidelines for the management of Bronchiectasis advise that sputum samples are sent for microbiology at baseline and at exacerbation. Guidelines recommend that antibiotic treatment at exacerbations should be guided by previous sputum microbiology. Amoxicillin and Doxycycline are guideline recommended empirical choices in primary care where no prior microbiology is available.
Methods We aimed to examine the UK cohort of the European Multicentre Bronchiectasis Registry (EMBARC) to determine whether management of these patients was in line with BTS guideline recommendations and examine antibiotic sensitivities at exacerbation. The organisms grown were identified and their sensitivity to amoxicillin and doxycycline, using sputum culture sensitivity data, was defined.
Results 7931 UK patients were analysed. 53.3% of patients had sputum sent at baseline and of those with exacerbations 42.3% had a sputum sample sent at exacerbation within 1 year of baseline. 21.7% of exacerbating patients had a prior stable sputum result available to guide exacerbation prescribing with only 34.8% of these showing concordance, with baseline sputum microbiology predictive of exacerbation sputum microbiology. Haemophilus influenzae (25.7%) and Pseudomonas aeruginosa (19.8%) are the most common organisms grown at exacerbation. Examination of all organisms grown at first exacerbation shows that 36.2% of these are susceptible to amoxicillin and 55.6% are susceptible to doxycycline. The difference in susceptibility between amoxicillin and doxycycline was largely accounted for by beta-lactamase producing H.influenzae, Moraxella catarrhalis and Staphylococcus aureus. Excluding P. aeruginosa gives 47.2% coverage of remaining organisms by amoxicillin and 73% coverage with doxycycline.
Conclusion Concordance with BTS guidelines on management of Bronchiectasis is low with sputum samples sent infrequently in stable state and at exacerbation. Microbiology concordance between stable and exacerbation samples is poor. There are high levels of innate and acquired resistance to amoxicillin making doxycycline potentially a more effective first choice antibiotic where no sputum culture results are available to guide prescribing.

What's in a genotype? Unpicking genetic links in complex disease

S63 GENOME-WIDE SEX-BY-SNP INTERACTION ANALYSIS OF SUSCEPTIBILITY TO IDIOPATHIC PULMONARY FIBROSIS

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10.1136/thorax-2021-BTSabstracts.69

Idiopathic pulmonary fibrosis (IPF) is a complex and heterogeneous fibrotic lung disease with median survival of 3 years. The disease has a genetic component, with genome-wide association studies (GWAS) identifying 15 genetic loci that influence IPF risk. The rs35705950 SNP (single nucleotide polymorphism), in the promoter region of the *MUC5B* gene, is the largest common genetic risk factor of IPF (OR=4.84 [95%CI: 4.37, 5.36], minor allele (T) frequency in cases=29.1%). IPF is more prevalent in males than females but the reasons behind this are not understood. We hypothesised that the genetic determinants of IPF might help to identify biological mechanisms that drive differences in IPF susceptibility and presentation between males and females. To address this, we performed a genome-wide sex-by-SNP interaction analysis of IPF susceptibility.

A genome-wide sex-by-SNP interaction meta-analysis was performed that included four independent IPF case-control data sets comprising a discovery of 3,432 cases (2,421 males & 1,011 females) and 18,559 controls (12,096 males & 6,463 females) of European descent. We sought replication in an independent dataset comprising 664 cases (488 males & 176 females) and 1,874 controls (507 males & 1,367 females).

We defined suggestive statistical significance as independent variants with $P<5\times10^{-5}$, and consistent direction of effect with $P<0.05$ in at least 3 of the 4 studies. Eight independent variants meeting these criteria were identified in the meta-analysis. Five variants had $P<0.05$ for IPF risk in both males and females when analysed separately; all five were observed to have an opposite direction of effect on males compared to females. None of the eight significant variants were associated ($P<0.05$) with IPF susceptibility when males and females were combined, and none reached our replication significance threshold in the independent dataset.

Our findings suggest that there may be differences in genetic determinants of IPF risk between males and females, but larger studies are needed to confirm the reported variants. Understanding the mechanisms behind these could provide further insight into different biological pathways that underlie pulmonary fibrosis.

S64 APPLICATION OF OPEN VIRTUAL PHEWAS TOOLS FOR EXPLORATORY ANALYSES OF RISK ALLELES IN IDIOPATHIC PULMONARY FIBROSIS

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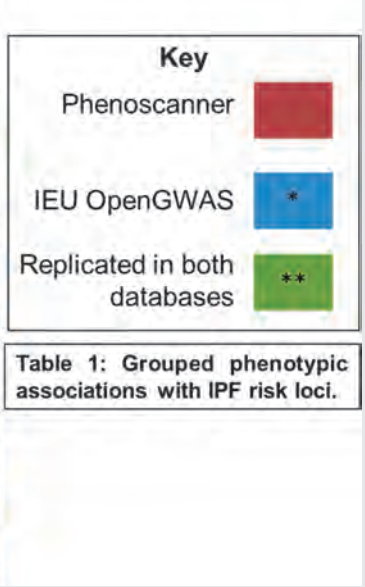
10.1136/thorax-2021-BTSabstracts.70

Introduction and Objectives Publicly available databases are becoming increasingly valuable resources for exploratory analyses of multi-omics data. This virtual PheWAS method demonstrates the application of open databases of GWAS summary data in identifying genetic disease-associated phenotypes, which can support further investigation into disease pathways and novel treatment targets.

We aimed to assess the application of open virtual PheWAS tools to identify significant phenotypic associations with established genomic risk loci in idiopathic pulmonary fibrosis (IPF).

Abstract S64 Table 1 Grouped phenotypic associations with IPF risk loci

		Phenotypic associations ($p<5x10^{-8}$)				
Gene/locus - SNP	GWAS p-value	Blood cell traits	Lung function	Cancer	IPF	General health and physical measurements
KIF15 - rs78238620	$4.05x10^{-14}$	No	No	No	No	No
MAD1L1 - rs12699415	$9.38x10^{-20}$	No	No	No	No	Yes**
DEPTOR - rs28513081	$1.93x10^{-11}$	No	No	No	No	Yes**
RTEL1 - rs41308092	$2.24x10^{-10}$	No	No	No	No	No
HECTD2 - rs537322302	$3.43x10^{-9}$	No	No	No	No	No
TERC - rs12696304	$7.09x10^{-13}$	Yes**	No	No	Yes	Yes*
FAM13A - rs2013701	$3.30x10^{-13}$	Yes*	Yes**	No	No	No
TERT - rs7725218	$1.54x10^{-20}$	Yes**	No	Yes**	No	Yes*
DSP - rs2076295	$2.79x10^{-30}$	No	Yes*	No	Yes	No
MUC5B - rs35705950	$1.18x10^{-203}$	No	No	No	Yes	No
ATP11A - rs9577395	$1.34x10^{-10}$	Yes**	No	No	No	No
IVD - rs59424629	$7.30x10^{-16}$	Yes*	Yes*	No	No	Yes*
AKAP13 - rs62023891	$1.27x10^{-10}$	Yes*	No	No	No	Yes*
MAPT - rs2077551	$2.83x10^{-16}$	Yes**	Yes**	Yes	No	Yes**
DPP9 - rs12610495	$2.92x10^{-12}$	No	No	No	Yes	No
7q22.1 - rs2897075	$3.10x10^{-14}$	Yes*	Yes*	No	No	Yes*



Methods A total of 16 GWAS-established single nucleotide polymorphisms (SNPs) associated with IPF that meet genome-wide significance ($p<5x10^{-8}$) in published studies were identified for evaluation. The Phenoscanner and IEU Open GWAS databases were queried via the *phenoscanner* and *ieugwasr* packages, respectively, in R (R Version 4.0.5). To maximise data retrieval, no p-value threshold filter was applied in initial SNP-trait association data collection. Subsequent statistical analysis and data plotting was performed in R to characterise significant phenotypic associations ($p<5x10^{-8}$).
Results Statistically significant ($p<5x10^{-8}$) phenotype associations were identified for 13/16 IPF risk loci (table 1). Associated phenotypes included lung function measures (FEV1/FVC, FVC), overall health, blood cell traits (eosinophil percentage of granulocytes, red blood cell (erythrocyte) count, neutrophil count) and multiple types of cancer (ovarian, prostate, breast, and lung). SNP-trait associations with blood cell traits and cancers observed for three SNPs (*TERT*, *TERC* and *MAPT*) were replicated in both databases. Some well-established genomic risk loci in IPF did not replicate phenotypic associations in both databases (rs35705950, *MUC5B; rs12610495*, *DPP9*.), highlighting the advantage of complementary dataset analyses to maximise identification of pleiotropic associations.
Conclusions Virtual PheWAS identified phenotypes associated with IPF risk loci that include blood cell traits and multiple cancers. Combining PheWAS results across multiple datasets is necessary to detect established phenotypes, demonstrating the importance of complementary sources in detecting novel pleiotropy. Open virtual analysis tools offer an efficient exploratory approach which can identify SNP-phenotype associations that warrant focused investigation through large scale PheWAS with disease-agnostic data.

REFERENCE

1. Allen RJ, *et al*. Genome-wide association study of susceptibility to idiopathic pulmonary fibrosis. *Am. J. Respir. Crit. Care Med*. 2020;**201**:564–574.

S65 GENOME-WIDE ASSOCIATION STUDY OF SURVIVAL TIMES AFTER DIAGNOSIS OF IDIOPATHIC PULMONARY FIBROSIS

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Introduction Idiopathic pulmonary fibrosis (IPF) is a devastating lung disease where the lungs become progressively scarred. The median survival time after diagnosis is three years, albeit disease progression varies greatly between individuals. Recently, large genome-wide association studies (GWAS) have shown there are a number of DNA regions associated with disease risk, however these variants are generally not associated with disease progression.
Aim To identify genetic variants associated with disease progression.
Methods We performed a two-stage GWAS of transplant-free survival times after diagnosis of IPF. In stage 1, genome-wide analyses were performed in three separate studies using a Cox proportional hazards models adjusting for age, sex, study centre and genetic principal components and the results were meta-analysed across the studies. In stage 2, variants with $p<5\times10^{-5}$ in the stage 1 meta-analysis and $p<0.05$ in each separate study with consistent direction of effects were tested for their association with IPF survival in independent samples. Variants were deemed associated with IPF survival if they were genome-wide significant in a meta-analysis of stages 1 and 2 ($p<5\times10^{-8}$). Immunohistochemistry and transcriptomics were performed to follow-up genes implicated by the genome-wide analysis.
Results A total of 1,481 IPF cases and 9 million genetic variants were included in the stage 1 analysis, and 397 individuals in stage 2. One variant, rs35647788 in an intron of *PCSK6*, was genome-wide significant in the stage 1 and 2 meta-analysis, and showed nominal significance ($p<0.05$) in each study with consistent direction of effects across all studies. Gene-prioritisation analyses identified *PCSK6*, of which rs35647788 lies in an intron of, as the most likely gene of interest. Immunohistochemistry showed that *PCSK6* was highly expressed in lung tissue samples from IPF cases compared to controls, specifically in the lung epithelium. In IPF cases, higher levels of circulating *PCSK6* were associated with poorer survival times and increased *PCSK6* gene expression was associated with a greater annual decline in lung capacity. There was little overlap between the genetic determinants of disease risk and survival times.
Conclusions This is the first GWAS of IPF survival which has identified novel important biological processes involved in the progression of IPF.

S66 IRON DEFICIENCY: COMPLICATIONS, COMPENSATIONS AND TREATMENTS BY HEREDITARY HAEMORRHAGIC TELANGIECTASIA MOLECULAR GENOTYPE

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Introduction and objectives Patients with pulmonary arteriovenous malformations (PAVMs) require normal iron levels in order to compensate appropriately for hypoxaemia. Low serum iron has also been shown to be associated with ischaemic stroke and venous thromboembolism risk in the population. Those with hereditary haemorrhagic telangiectasia (HHT) are at risk of developing iron deficiency if the iron lost during nosebleeds and/or gastrointestinal haemorrhage is not adequately replaced. The aims of this study were to examine associations between the HHT molecular genotype and iron deficiency indices.
Methods A database containing repeated measurements from 426 genotyped HHT and PAVM patients was retrospectively analysed to compare iron deficiency rates, complications,

compensations and responses to iron deficiency treatment between HHT molecular genotypes.

Results Serum ferritin was higher in *ACVRL1* (median 31; IQR 17.5,75) than *ENG* (median 25; IQR 13,50.5; $p=0.006$) and *SMAD4* (median 26; IQR 5,39.5; $p=0.03$) HHT/PAVM patients, as shown by Kruskal-Wallis and Dunn's post-test. Age and sex-adjusted linear regression analysis found that a *SMAD4* variant was predictive of a decrease in serum iron ($p<0.0005$). Mean corpuscular volume was lower in *SMAD4* (median 75; IQR 70,87) than *ACVRL1* (median 90; IQR 86,93; $p<0.0001$) and *ENG* (median 89; IQR 84,93; $p<0.0001$) patients. This was compensated for by higher red blood cell counts in *SMAD4* (median 5.4; IQR 5,6) than *ACVRL1* (median 4.7; IQR 4.2,5; $p<0.0001$) and *ENG* (median 4.8; IQR 4.3,5.1; $p<0.0001$) patients, so that ultimately, haemoglobin concentrations did not differ significantly between molecular genotypes ($p=0.39$). Associations between molecular genotype and other iron deficiency complications, such as ischemic stroke and venous thromboembolism are under evaluation.

Conclusions *SMAD4* HHT/PAVM patients had lower iron indices, more marked indicators of iron deficiency anaemia, and displayed evidence of different compensatory mechanisms to maintain haemoglobin concentration. We speculate that the role of SMAD4 as a hepcidin regulator may explain why *SMAD4* patients have this unique phenotype. A randomised-control trial prospectively assessing differing molecular genotypes' responses to iron treatment would help to further clarify relationships between iron deficiency and HHT molecular genotype.

S67 WHOLE GENOME SEQUENCING OF PATIENTS WITH PULMONARY ARTERIOVENOUS MALFORMATIONS AND HEREDITARY HAEMORRHAGIC TELANGIECTASIA

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Background The personalisation of medicine to target genetic modifications may benefit patients. A well characterised complex disease with a large variation in phenotype and whole genome sequencing could be used to determine new genetic links to disease manifestations. Pulmonary arteriovenous malformations (AVMs) provide one such disease, especially for the patients with underlying hereditary haemorrhagic telangiectasia (HHT). Both diseases were specifically recruited to the 100,000 Genomes Project.

Methods Literature searches for relevant genes that could impact on the variable phenotypes were performed. The genes of interest were investigated within the Research Environment of the 100,000 Genomes Project using LabKey. For each variant, potential pathogenicity was assigned using general population allele frequencies (GnomAD v3.1.1) and Combined Annotation Dependent Depletion (CADD) scores. Anonymised, categorised data were exported through the Research Environment Airlock in order to integrate with detailed blood results and sub-phenotypes.

Results The 75 genes of interest were split into five groups by their activity. 56 of these genes (75%) had variants within the participants. All variants were rare with allele frequencies less than 0.003. CADD scores ranged from 0–42 where scores above 15 are commonly considered to indicate likely deleteriousness. There was a difference in CADD scores between the gene categories (Kruskal Wallis p=0.0073), and the categories and genes with a greater variant burden in the study cohort also had higher gene damage indices in the general population. There was no difference in variants or genes according to the HHT gene (most commonly ENG or ACVRL1). Examination in relation to patient phenotypes is ongoing.

Conclusions Patients with pulmonary AVMs and HHT commonly have rare variants in genes of potential relevance to their phenotype. Phenotypic associations are required to establish if this is by chance or of pathophysiological importance.

Acknowledgements This research was made possible through access to the data and findings generated by the 100,000 Genomes Project, managed by Genomics England Limited funded by the Department of Health and Social Care, the National Institute for Health Research (NIHR) and NHS England.

Gazing through the crystal ball: predicting outcomes from COVID-19

S68 NATIONAL COVID POINT OF CARE LUNG ULTRASOUND EVALUATION (SOCIETY FOR ACUTE MEDICINE WITH THE INTENSIVE CARE SOCIETY)

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Introduction The Society for Acute Medicine and the Intensive Care Society developed a collaborative evaluation of point-of-care lung ultrasound (LUS) in the UK to describe the scope of current practice and explore performance during real-world application. All participating hospitals have established expertise in point-of-care imaging.

https://ics.ac.uk/ICS/ICS/FUSIC/Documents/National_COVID_POCUS_service_evaluation.aspx describes the project.

Methods We report the evaluation of all imaging studies performed outside the intensive care unit. An ordinal scale measured the severity of loss of lung aeration. The relationship between this score and adverse outcomes was explored using generalised linear models. A composite diagnostic score was used to describe diagnostic performance compared against polymerase chain reaction (PCR) results as a reference standard.

Results 297 ultrasound examinations from 295 patients were recorded, between February and September 2020, from 7 sites. Nasopharyngeal swab samples were positive in 145 patients (49.2% 95%CI 43.5–54.8). A multivariate model combining three ultrasound variables had an AUC of 0.79 (95%CI 0.73–85) to predict PCR positivity. The composite outcome of death or intensive care admission at 30 days occurred in 83 (28.1%, 95%CI 23.3–33.5). Lung ultrasound was able to discriminate the composite outcome with a reasonable level of accuracy (AUC 0.76 95%CI 0.69–0.83) in univariate analysis. The relationship remained statistically

Abstract S68 Table 1

Characteristic	Overall, N = 295[1]	Composite ultrasound severity score (0-36)					p-value[2]
		0, N = 52[1]	1-8, N = 29[1]	9-17, N = 5[1]	18-26, N = 137[1]	>26, N = 72[1]	
Age	66 (50, 77)	70 (47, 78)	63 (45, 77)	63 (62, 83)	67 (51, 76)	62 (50, 78)	0.97
Unknown	3	0	0	0	1	2	
Sex							0.21
Male	198 (68%)	30 (58%)	24 (83%)	3 (60%)	93 (68%)	48 (69%)	
Female	95 (32%)	22 (42%)	5 (17%)	2 (40%)	44 (32%)	22 (31%)	
Unknown	2	0	0	0	0	2	
Duration of illness	6 (3, 11)	4 (1, 9)	3 (2, 7)	7 (2, 10)	7 (4, 14)	7 (3, 11)	0.010
Unknown	9	2	1	0	3	3	
Interval from admission to study	0.00 (0.00, 1.00)	0.00 (0.00, 1.00)	1.00 (0.00, 1.00)	0.00 (0.00, 1.00)	0.50 (0.00, 1.00)	0.00 (0.00, 2.00)	0.53
Unknown	3	1	0	0	1	1	
SARS-CoV-2 PCR							
Neg	145 (49%)	37 (71%)	18 (62%)	4 (80%)	60 (44%)	26 (36%)	
Pos	126 (43%)	9 (17%)	9 (31%)	1 (20%)	68 (50%)	39 (54%)	
Unknown	24 (8.1%)	6 (12%)	2 (6.9%)	0 (0%)	9 (6.6%)	7 (9.7%)	
S/F ratio							
>440	117 (40%)	39 (75%)	14 (48%)	2 (40%)	50 (36%)	12 (17%)	
440-200	139 (47%)	13 (25%)	13 (45%)	3 (60%)	71 (52%)	39 (54%)	
<200	39 (13%)	0 (0%)	2 (6.9%)	0 (0%)	16 (12%)	21 (29%)	
30 day mortality	65 (22%)	3 (5.8%)	5 (18%)	2 (40%)	30 (22%)	25 (35%)	0.001
Unknown	4	0	1	0	3	0	
Death or ICU admission	83 (28%)	4 (7.7%)	6 (21%)	2 (40%)	35 (26%)	36 (50%)	<0.001
Unknown	4	0	1	0	3	0	

[1]Median (IQR) or Frequency (%)
[2]Kruskal-Wallis rank sum test; Fisher's exact test

significant in a multivariate model controlled for age, sex, the time interval from admission to scan and the severity of hypoxia.

Conclusions LUS discriminates between patients at increased risk of deterioration. The ultrasound severity score appears to be best calibrated with risk in patients receiving oxygen therapy. The evaluation provides further evidence of the clinical utility of LUS which combined with the potential practical advantages provide a strong argument for wider adoption and integration of the practice.

S69 INFLAMMATORY BIOMARKERS PREDICT CLINICAL OUTCOMES IN PATIENTS WITH COVID-19 INFECTION: RESULTS FROM THE PREDICT-COVID19 STUDY

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Introduction COVID-19 is reported to cause profound systemic inflammation. Anti-inflammatory treatments such as corticosteroids and anti-IL-6 receptor monoclonal antibodies reduce mortality. Identifying inflammatory biomarkers associated with increased morbidity and mortality may allow both prediction of outcomes and identification of further therapeutic targets.

Methods A prospective observational study of patients with PCR-confirmed SARS-CoV-2 admitted to a single centre in Dundee, UK. Patients were enrolled within 96 hours of hospital admission. 45 inflammatory biomarkers were measured in serum using the Olink Target48 proteomic-based biomarker panel. Additional markers were measured by ELISA/immunoassay and enzyme activity assays. Severe disease was defined as the requirement for non-invasive or mechanical ventilation or death within 28 days of admission. Discrimination between groups was evaluated using the area under the receiver operator characteristic curve (AUC).

Results 176 patients were included (mean age 64.9 years, SD 13.6), 101 were male (57.4%). 56 patients developed severe disease (31.8%), mortality was 16.5%. Using ROC analysis, the strongest predictors of severity ($p<0.0001$) were CCL7/MCP3 (AUC 0.78 95%CI 0.70–0.85), IL6 (0.73 95%CI 0.66–0.81), IL15 (0.73 95%CI 0.65–0.81), CXCL10/IP10 (0.73 95%CI 0.65–0.81). Further significant predictors of severity included CXCL11, IL10, CCL2/MCP1 and CSF2/GM-CSF. Predictors of mortality were CXCL10 (0.78 95%CI 0.69–0.86), IL6 (0.76 95%CI 0.67–0.85), IL15 (0.75 95%CI 0.66–0.84), IL10 (0.73 95%CI 0.64–0.82). Further significant predictors of mortality were CXCL9 and CCL7.

Conclusion Multiple circulating biomarkers were identified which predicted disease severity and mortality in COVID19, indicating clinical value in measurement upon hospital admission to highlight high-risk patients. Associated biological processes for these proteins included anti-viral and interferon responses and immune cell chemotaxis. In particular, CCL7 and CXCL10, the strongest predictors of severity and mortality in this dataset, are key players in the cytokine storm and immune cell recruitment linked with COVID19. These chemokines are not currently therapeutic targets, highlighting key avenues for further clinical research.

S70 EFFECTIVENESS OF DIFFERENT PARAMETERS AT ADMISSION AS PROGNOSTIC MARKERS FOR MORTALITY DUE TO SARS-COV-2: A 2-CENTRE EXPERIENCE IN UK AND SPAIN

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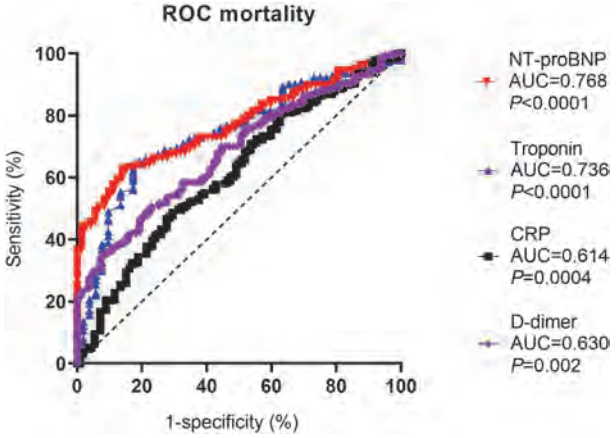
Rationale SARS-CoV-2 is an international health crisis that has overwhelmed the healthcare capacity of many countries. There is a need for a simple and easily usable biomarker to assist in making urgent clinical decisions.

Objectives We sought to find and validate a simple, easily measurable, dependable single-parameter biomarker to predict mortality in swab-positive SARS-CoV-2 patients.

Methods All swab-positive patients were recruited from Cambridge University Hospitals NHS Trust between March-July 2020 (inclusive) to form the Cambridge cohort. All swab-positive patients were recruited from the HM Hospitales group of hospitals from March-April 2020 to form the Spanish cohort. Details of clinical parameters and potential biomarkers were extracted from the electronic patient records. Data was de-identified prior to access.

Measurements and Main Results There were 522 patients in the Cambridge cohort and 1,643 in the Spanish cohort, with a mean age of 64.6±20.9 and 66.8±15.8 years, respectively. Age, CRP, D-dimer, urea, troponin, NT-proBNP, IL-6 and ISARIC scores were significantly raised in the non-survivors *versus* survivors for the Cambridge cohort ($P<0.0001$ for all). The two cohorts were analysed independently using Receiver Operating Curves and compared to a previously validated multi-component score (ISARIC). For the Cambridge cohort, troponin and NT-proBNP levels proved to be the most effective single parameters at predicting mortality, with an area under curve (AUC, 95% confidence interval) of 0.7680 (0.7098- 0.8263) and 0.7360 (0.6724–0.7991) respectively, $P<0.0001$ for both. The AUC for ISARIC (an 8-component score) was 0.8069 (P<0.0001). Interestingly the AUCs for CRP and D-dimer were not as high as would be expected (0.6141 [0.5534–0.6747] and 0.6808 [0.6178–0.7438] respectively, figure 1). A similar pattern is seen in the Spanish cohort, with troponin (AUC of 0.800 [0.7728–0.8276]) outperforming CRP and D-dimer (0.6858 [0.6525–0.7192] and 0.6979 [0.6605–0.7352], respectively).



Abstract S70 Figure 1 ROCs for parameters with 30-day mortality as outcome

Conclusions The cardiac biomarkers troponin and NT-proBNP proved to be the best single-parameter biomarkers for predicting mortality in the Cambridge cohort, and this was borne out in the Spanish cohort.

S71 A RETROSPECTIVE ANALYSIS OF ROX SCORE FOR PREDICTING TREATMENT FAILURE AND PROGRESSION TO INVASIVE VENTILATION IN COVID PATIENTS REQUIRING ENHANCED RESPIRATORY SUPPORT

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Introduction Due to the rapid escalation of demand for critical care during the COVID19 pandemic there was an increasing requirement for systems that predicted patients requirement of invasive respiratory support. While more complex prediction models have been proposed (Douville et al. 2021 BJA 123:3 578- 589), we analysed the validity of the existing ROX score test, in patients presenting with severe COVID19 respiratory disease.

Method We retrospectively utilised data for COVID HDU admissions in a single UK hospital during a fixed period from Nov 2020 to Feb 2021. The ROX score was calculated at 2, 6, 12 and 24hr for patients started on either CPAP or HFNO and who were candidates for full escalation to critical care in the event of deterioration. ROX score pass (>4.87), fail (<3.85) or indeterminate (3.85–4.87) was decided using the original values determined by Roca et al (2016 JCC 35; 200–205), this was then used to determine the relative risk of intubation (ROI) for patients with low ROX score during their first 24hrs on enhanced respiratory support.

Results - Of the 233 patients in our dataset, 49 met our inclusion criteria; 28 on HFNO and 21 on CPAP.

Abstract S71 Table 1

	ROX<3.85		ROX3.85–4.87	
	ROI	RR	ROI	RR
CPAP	87.5%	7 (95%CI 1.1–44.6 P0.019)	66.6%	5.33 (95%CI 0.78-36.3 P0.043)
HFNO	87.5%	9.63 (95%CI 1.45-63.92 P0.009)	33.3%	3.66 (95%CI 0.48-29.48 P0.11)

Conclusion Our study suggests ROX score is valid in predicting intubation in COVID patients requiring enhanced respiratory support. Given the small sample size, further research utilising data from multiple sites would be useful to corroborate findings

S72 LUNG FUNCTION OUTCOMES IN CHILDREN WITH PAEDIATRIC INFLAMMATORY MULTISYSTEM SYNDROME – TEMPORALLY ASSOCIATED WITH SARS-COV-2 (PIMS-TS)

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10.1136/thorax-2021-BTSabstracts.78

Introduction In March-April 2020, and again in winter '20–21, children began presenting to our centre with a novel systemic inflammatory syndrome associated with SARS-CoV-2 exposure or infection. A group of these children required respiratory support. We present updated data on lung function outcomes following discharge. Data in a subset of individuals in this group has previously been reported (Penner et al, Lancet Child Adolesc Health 2021).

Methods Children with PIMS-TS requiring invasive, or non-invasive, ventilatory support during the acute phase undertook spirometry, body plethysmography and a measurement of transfer factor at a structured follow up 6-weeks post discharge. Data was collected prospectively between April 2020 and February 2021 and are reported as descriptive statistics, with predicted values reported in comparison to Global Lung Initiative data where available.

Results 30 lung function measurements (in 29 patients) were included (table 1). Spirometry was performed at all visits with 1 child unable to achieve a result fulfilling ATS/ERS criteria, and was normal in all other children. 1/27 child (4%) showed evidence of abnormal alveolar volume and gas exchange efficiency.

Conclusion Similar to other systemic inflammatory syndromes (Staphylococcal toxic shock, Kawasaki disease), and unlike Covid-19 in adults, it appears that children's lungs are at low risk of long term damage by PIMS-TS. This data is preliminary and we have not assessed exercise tolerance, or outcomes in those with presentations that did not require initial respiratory support. Assessments are ongoing in this cohort and in children presenting following infection with new variants of concern.

Abstract S72 Table 1 Table of lung function results expressed as mean and 95% CI = Confidence Interval

Demographic	N=	Mean	(95% CI)
Age (years)	N= 30	11.73	(10.70, 12.77)
Sex, Female%	N=14 (48%)		
Height (cm)	N=30	152.24	(145.62, 158.86)
Fe_{NO} (ppb)	N=26	16.28	(9.01, 23.55)
$FEV_1\%_{pred}$ (%)	N=29	103.85	(98.04, 109.66)
FEV_1 z-score	N= 29	0.32	(0.00, 1.00)
$FVC\%_{pred}$ (%)	N= 29	103.3	(98.25, 108.35)
FVC z-score	N= 29	0.25	(-0.15, 0.66)
FEV1:FVC	N= 29	98.84	(96.69, 100.99)
$Ratio\%_{pred}$ (%)			
FEV1:FVC	N=29	-0.09	(-0.41, 0.23)
Ratio z-score			
$TL_{CO}\%_{pred}$	N=23	86.69	(80.00, 93.39)
TL_{CO} z-score	N=23	-1.04	(-1.70, -0.37)
$K_{CO}\%_{pred}$	N=23	97.22	(91.34, 103.01)
K_{CO} z-score	N=23	-0.22	(-0.65, 0.21)
$VA\%_{pred}$	N=23	88.87	(84.09, 93.65)
VA z-score	N=23	-1.01	(-1.44, -0.58)
$FRC_{pleth}\%_{pred}$ (%)	N=15	88.00	(80.99, 95.01)
FRC_{pleth} z-score	N=15	-0.77	(-1.26, -0.28)
$TLC\%_{pred}$ (%)	N=15	98.2	(92.17, 104.23)
TLC z-score	N=15	-0.15	(-0.66, 0.36)
$RV\%_{pred}$ (%)	N=15	83.47	(71.34, 95.60)
RV z-score	N=15	-0.43	(-0.88, 0.02)

REFERENCE

1. Penner, et al. 6-month multidisciplinary follow-up and outcomes of patients with paediatric inflammatory multisystem syndrome (PIMS-TS) at a UK tertiary paediatric hospital: a retrospective cohort study. *Lancet Child Adolesc Health* 2021;5 (7):473–482.

A cut above: an update in thoracic surgery

S73 MANAGEMENT OF BRONCHIAL STENOSIS IN POST LUNG TRANSPLANTATION – INITIAL EVALUATION OF BIODEGRADABLE STENTS

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10.1136/thorax-2021-BTSabstracts.79

Introduction Bronchial stenosis one of the most common airway complications post lung transplantation. The incidence varies from about 5 to 20, most commonly seen between 2 to 9 months post transplantation and is a significant cause of morbidity and mortality.

Methods Retrospective analysis of prospectively collected data of patients who have undergone lung transplantation at the institute over the last 10 years. Patients who have had bronchial stenosis post operatively were identified which was identified on surveillance/diagnostic bronchoscopy. Data was gathered with regards to the type of interventions used to treat the bronchial stenosis and the treatment outcomes were compared, along with looking at the efficacy of absorbable bio degradable stents.

Results A total of 524 lung transplantations were performed, which included bilateral single sequential, single and heart lung transplantation. 44 Patients developed bronchial stenosis out of which 32 patients required interventions for the stenosis. The most common site for non-anastomotic stenosis was found to be bronchus intermedius (28 patients – 63%) followed by left main bronchus (9 patients – 20%), right main bronchus (5 – 11%) and left upper lobe bronchus (2%). The patients were treated in a stepwise approach, initially balloon dilatation (32 patients - 72%), which was followed up with cryotherapy (15 patients-34%) and ultimately treated with endobronchial stents (9 patients – 18%).

Currently 4 Patients have undergone biodegradable stent placements (2 unilaterally and 1 bilateral) which show better short-term outcomes as compared to metallic stents.

With metallic stents, 3 patients have had an incidence of bronchomalacia, 1 required restenting, and 2 had persistent stenting post removal.

The biodegradable stents have had no reports of bronchomalacia and also decreased the need for intervention to removal the stent.

Conclusions Biodegradable stents have been newly introduced which hold strength initially and degrade over months. It also bypasses the issue of stent removal. Biodegradable stents also show improved FEV1 post bronchial stenosis. Overall biodegradable stents show a promising outcome, although long term follow up and prospective studies need to be undertaken to adequately compare benefits and subsequent complications as compared to conventional stents.

S74 LUNG VOLUME REDUCTION: A LARGE-VOLUME SINGLE-CENTRE EXPERIENCE WITH AN ANALYSIS OF SEASONAL VARIATION

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10.1136/thorax-2021-BTSabstracts.80

Introduction and Objectives Despite available evidence and recommendation, lung volume reduction (LVR) for severe emphysema remains under-utilised, due to a perception of excessive morbidity/mortality and associated costs. There is suggestion that outcomes may be more favourable in the warmer months, however benefits of this strategy remain uninvestigated. We aimed to review short-term outcomes of our LVR programme and assess whether seasonal variations can be observed.

Methods We retrospectively reviewed data from a prospectively collected database and electronic patient records. All consecutive procedures performed by thoracoscopy (LVRS), endobronchial valves (EBV) or endobronchial coils (EBC) between 2015–2021 were considered.

Results 105 primary procedures (43 LVRS, 45 EBV, 10 EBC) were undertaken in 98 patients (M:F 58:40, median age 66, 40–84). Second-stage contralateral procedures were 3 EBC and 4 LVRS (2 planned <6months, 1 at further deterioration >3yrs later, 1 salvage after poor response to EBV).

Median length of stay (LOS) for LVRS was 8 days (6–56), with 86% discharged within 14 days. Prolonged air leak >7days was seen in 47%. Median LOS was 3 days (2–55) for EBV, 2 days (1–6) for EBC. Pneumothorax occurred in 13 EBV (29%) and 1 EBC, always within 72hrs; median LOS in this group was 12 days (6–55).

LVRS was associated with highest rate of complications (48% uncomplicated procedures vs 71% for EBV and 80% for EBC). Additional procedures were more likely required post-EBV (12 vs 2 post-LVRS) for revision/reinsertion (8), removal (3) or air leak closure (1).

Critical care admission for the whole cohort was 6.6% (4 LVRS, 2 EBV). 90-day mortality was 4% (3 after LVRS within 30-days, 1 post-EBV revision at 54-days).

Procedures were equally distributed across all seasons. Uncomplicated procedures were significantly more frequent in the summer (62%) vs winter (33%) for LVRS, but not for EBV/EBC. LOS was not significantly dissimilar in all seasons for all modalities (table 1).

Conclusions Short-term clinical outcomes suggest perceptions of excessive morbidity are invalid. A near-50% reduced complication rate of LVRS during summer vs winter is suggestive of possible seasonal variation, which may have implications for patient selection and MDT decision-making, and should encourage further investigation on the topic.

S75 REDO BRONCHOSCOPY AFTER ENDOBRONCHIAL LUNG VOLUME REDUCTION – INDICATIONS AND IMPLICATIONS

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10.1136/thorax-2021-BTSabstracts.81

Background Endobronchial lung volume reduction (EBLVR) is an effective treatment in patients with severe emphysema. It is perceived as a low-risk, low-morbidity procedure but there is the potential for longer term complications requiring re-intervention. We have analysed our experience with revisional (redo) bronchoscopy to identify learning points for practice.

Method In a prospective cohort study of 58 patients, treated by an already experienced team, we have collected follow-up clinical data including the need, indication and outcome of redo bronchoscopy. We compared the characteristics of those requiring redo bronchoscopy with the remainder who did not.

Results 18 of 58 (31%) patients required revisional bronchoscopy at a median interval of 6 (1–13) months after the initial procedure. The indications were: lack of initial deflation 4 (22%); subsequent loss of initial deflation 12 (66%); haemoptysis 1 (6%) and secondary infection 1 (6%). The findings at redo bronchoscopy included: valve blockage 9 (52%) (5 due to mucus, 4 due to granulation) valve expectoration 5 (28%), valve leakage 2 (10%), valve colonisation 1 (5%) and 1 (5%) new development of collateral ventilation. Radiological valve anomalies were reported prior to redo bronchoscopy CT scans in only 9 of 18 (50%) cases and included: valve migration in 4, loss of volume reduction in 3 and valve blockage in 2.

Whilst pre-operative airways obstruction was higher in the redo group the only other potential risk factor for revisional bronchoscopy was lower lobe position.

Conclusion The need for revisional bronchoscopy after initial EBLVR is unpredictable but frequently required and indicates the need for close follow up and a low threshold for re-intervention on clinical grounds alone if the initial outcome is suboptimal.

Abstract S74 Table 1 Summary table of median length of stay (LOS) and rate of uncomplicated procedures, stratified by modality and season

	Total Number of Procedures	Median LOS EBV (days)	Median LOS LVRS (days)	Median LOS EBC (days)	Uncomplicated All modality (%)	Uncomplicated EBV (%)	Uncomplicated LVRS (%)	Uncomplicated EBC (%)
Spring	22	3	11.5	n/a	54.5%	66.7%	40%	n/a
Summer	29	3	5	2	69%	66.7%	**61.5%**	100%
Autumn	23	3	8	2	60.9%	80%	50%	75%
Winter	24	3	6	3.5	62.5%	75%	**33.3%**	50%

Abstract S75 Table 1

Median (Range)	No Redo	Redo	p-value
Number	40(22M:18F)	18(11M:7F)	
Age (Year)	68(43-82)	69(57-80)	0.2605
BMI (Kg/m^2)	22(13-37)	25.4(16.1-34.2)	0.1652
LUL:LLL	23:10	5:5	NS
RUL:RLL	5:2	4:4	NS
Upper:Lower	28:12	9:9	0.237
FEV1 (%predicted)	28.8(13.8-58)	35.3(17-62)	0.0351
DLCO (%predicted)	37.8(10.7-84)	38(19-61)	0.4346
RV (%predicted)	209(43.2-350.6)	211(130-289)	0.1750
Fissure Integrity			
Target:Non-Target Lobe Volume Ratio	1.12(0.6-2.22)	0.96(0.48-1.56)	0.1429
Target:Non-Target Lobe Perfusion Ratio	0.4(0-1.5)	0.32(0.19-0.91)	0.2214
Target:Non-Target Lobe Emphysema Severity (Voxel Density <910 HU)	1.25(0.67-6)	1.23(0.83-2.86)	0.3494
Target:Non-Target Lobe Emphysema Severity (Voxel Density <950 HU)	1.61(0.55-26.5)	1.69(0.75-4.8)	0.2492
Pathogenic Bacteria Post-Initial EBV	3	2	NS
Pneumothorax Post-Initial EBV	17	2	NS

S76 CHEST TRAUMA: AN EXPERIENCE OF A RESPIRATORY SUPPORT UNIT WITH LEVEL 2 CARE IN THE NORTH EAST OF ENGLAND

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10.1136/thorax-2021-BTSabstracts.82

Introduction Falls cause 75% of trauma in patients above 65 years of age and thoracic trauma is the second commonest injury; rib fractures are the commonest thoracic injury. There is wide variation in care. Older trauma patients are less likely to have trauma assessments. Rib fractures carry up to 12% mortality with up to 31% developing pneumonia.[1] The number of fractures correlates with morbidity. Northumbria Healthcare has a team of respiratory consultants, physiotherapists, specialist nurses and anaesthetists for rib fracture management on a respiratory support unit.

Methods With Caldicott approval, basic demographics and clinical outcomes of patients admitted with thoracic trauma between Aug 20-Apr 21 were analysed. Descriptive statistical methodology was applied.

Results 119 patients were identified. Mean age was 71.1 years (range 23–97). 53 were male, 66 female. Mechanism of injury were falls from standing (65), falls down stairs/bed or in the bath (18), ladders (4), cycling (12), assault (3), road accidents (8) and 9 others (for example off horses). LOS was 7.3 days (range 1–54). 85 patients had more than 1 co-morbidity. 26 had a full trauma assessment and 75 had pan CTs. Mean number of rib fractures was 3.6. 31 (26%) had a pneumothorax and/or haemothorax. 18 chest drains were inserted (all small bore) and 1 needle aspiration done. No cardiothoracic input was required. Isolated chest trauma was present only in 45 patients. All had pain team review, 22 erector spinae catheters were inserted with 2 paravertebral blocks. 82 patients did not require oxygen, 1 required CPAP and 1 HFNC. 7 needed intensive care transfer. 20 (17%) developed pneumonias.16 (14%) deaths occurred within 30 days (1 heart failure and cancer progression, 2 Covid and 14 pneumonias)-all were in those with falls from standing. There was no correlation between number of fractured ribs, length of stay and mortality.

Conclusions High level care for thoracic trauma can be performed by the respiratory team with analgesia managed by the pain team. 42% of pneumothoraces/haemothoraces were observed. Falls from standing are associated with significant mortality and morbidity. The service is now complemented by a frailty assessment service.

REFERENCE

1. https://academic.oup.com/ageing/article/49/2/161/5673134

S77 THE EFFECT OF SURGERY ON LUNG FUNCTION IN PATIENTS WITH IDIOPATHIC SCOLIOSIS

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10.1136/thorax-2021-BTSabstracts.83

Introduction Idiopathic scoliosis, the most common form of scoliosis, results in an abnormal lateral curvature of the spine. It typically affects children aged 10–16 and can result in pain and reduced respiratory function largely due to a restrictive lung defect. Treatment can involve bracing and surgical procedures and it is currently unclear how these treatments affect lung development.

Methods We performed lung function studies on 26 children with idiopathic scoliosis before and at 1–3 years after spinal surgery. Mean height for age was used to calculate lung function scores instead of measured height due to the effects of

scoliosis on measured height. Standard deviation score calculated from the Global Lung Initiative (GLI 2012) data was used to identify change.

Demographic data including date of birth, postcode, gender, date of surgery, height prior to surgery, Cobb angle, and the vertebrae involved in surgery was collected.

Results Children with scoliosis have reduced forced expiratory volume in 1 second (FEV1) and reduced forced vital capacity (FVC), with median Z scores of -1.5 and -1.1 respectively. Lung function undertaken between two and three years after surgery showed an absolute improvement, but no change in Z score, suggesting some lung function may be permanently lost despite the skeletal correction.

Conclusion Scoliosis surgery can halt the decline in lung function but does not result in improved lung function at 1–3 years post-surgery.

Under pressure: an update in pulmonary vascular disease

S78 PREDICTING POSTCAPILLARY PULMONARY HYPERTENSION: VALIDATION OF THE H2FPEF AND OPTICS SCORES

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10.1136/thorax-2021-BTSabstracts.84

Background Distinguishing pulmonary arterial hypertension (PAH) from postcapillary pulmonary hypertension (PH) is crucial yet can be challenging. The H2FPEF and OPTICS scores have been proposed as predictors of an elevated pulmonary artery wedge pressure, in order to inform whether to proceed with further investigations for PH, including right heart catherisation. These scores include routinely available information including age, cormorbidities and transthoracic echocardiogram and electrocardiogram indices. The aim of this study was to externally validate the H2FPEF and OPTICS scores for use in vetting new PH referrals.

Methods A retrospective analysis of was undertaken of all patients who were referred to a tertiary PH centre in Scotland between 2016 and 2020. Patients were included if they have undergone diagnostic admission for PH, including right heart catheterisation, and were subsequently diagnosed with idiopathic PAH, heritable PAH, pulmonary veno-occlusive disease or postcapillary PH. Records were screened for components of the scores, which were calculated for each patient and compared to the post-investigation diagnosis as judged by multidisciplinary consensus. A H2FPEF score of $\geq$6 and an OPTICS score of $\geq$104 were used as thresholds for predicting postcapillary PH.

Results 107 patients with precapillary pulmonary hypertension and 86 patients with postcapillary pulmonary hypertension were included. Retrospective application of the OPTICS score demonstrated that pre-test scoring would detect 28% of cases with postcapillary pulmonary hypertension (sensitivity 0.28) yet at the cost of misdiagnosing 4% of patients with PAH as postcapillary PH (specificity 0.96). The H2FPEF score had a far greater sensitivity (0.70) yet reduced specificity (0.91), implying 9% of PAH cases would be misdiagnosed. Pyramid charts for both scores are shown in figure 1. Receiver operator curve analysis demonstrated an area under the curve of 0.82 for the OPTICS score and 0.85 for the H2FPEF score.

Conclusion This study further demonstrates the OPTICS scores ability to non-invasively detect between 1 in 3 and 1 in 4 cases of postcapillary pulmonary hypertension whilst maintaining a low false positive rate. The H2FPEF score had a greater sensitivity, yet crucially a lower specificity and hence a higher risk of misdiagnosing true PAH.

S79 SELEXIPAG TITRATION AND DOSING PATTERNS IN PATIENTS WITH PULMONARY ARTERIAL HYPERTENSION (PAH) IN A REAL-WORLD CLINICAL SETTING: INSIGHTS FROM THE EXPOSURE STUDY

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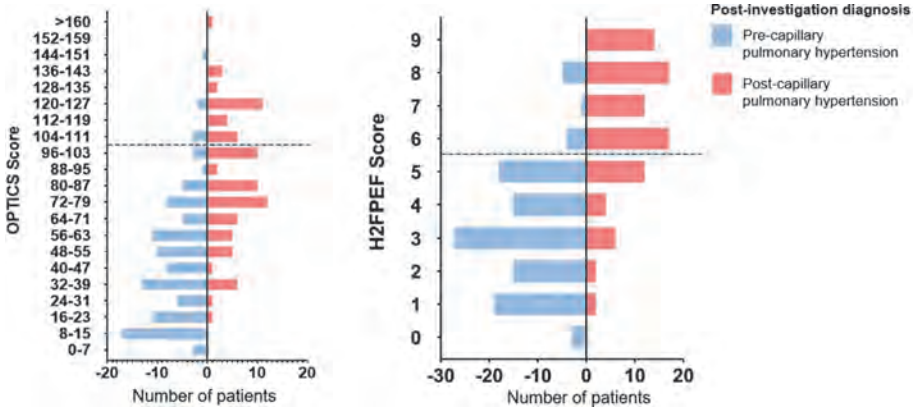
10.1136/thorax-2021-BTSabstracts.85

Selexipag is an oral IP prostacyclin receptor agonist approved for the long-term treatment of pulmonary arterial hypertension (PAH) in adults with WHO FC II/III symptoms. Selexipag is administered twice daily (b.i.d) and titrated to the patient's highest tolerated dose. In the GRIPHON trial, treating patients with an individualized dose, identified during a 12-



Abstract S78 Figure 1

week titration period, provided a consistent beneficial outcome across doses. Here we describe the titration and dosing of selexipag in a real-world clinical setting, using EXPOSURE study data.

EXPOSURE (EUPAS19085) is an ongoing, international, multicentre, prospective, observational study of PAH patients initiating any new PAH-specific therapy. These analyses include all patients receiving selexipag with follow-up data. Titration was considered complete once a stable dose was taken for ≥3 weeks after the highest identified dose. Patients entered the maintenance phase on week 2 of that stable dose. Titration and maintenance phases were defined after data collection. Patient characteristics and treatment patterns at selexipag initiation are described. Values are median (range) unless otherwise stated.

As of June 2020, 300 selexipag-treated patients had follow-up data. At selexipag initiation: age and time from PAH diagnosis was 60 (18–87) and 2.7 (0.0–51.3) years; 70% patients were female and 60% were at intermediate risk of 1-year mortality (COMPERA approach). PAH was classified as idiopathic (51.3%), associated (41.7%), drug/toxin induced (2.7%), and heritable (4.3%). Exposure to selexipag was 5.4 (0.2–29.0) months. Most (77%) patients initiated selexipag as part of a triple combination therapy regimen. At last available information, the titration was completed in 224 (75%) patients, undergoing in 55 (18%) and not completed in 21 (7%). Titration duration was 7.3 (1.0–25.7) weeks. The first maintenance dose achieved was 800 (50–2000) µg b.i.d and lasted for 15.7 (2.0–118.3) weeks. During the selexipag exposure period, 168 (75%) patients remained on the same maintenance dose, 41 (18%) patients had one dose adjustment and 15 (7%) patients had ≥2 dose adjustments.

With a median duration of 7.3 weeks, the observed titration period is in line with GRIPHON and the selexipag prescribing information. Approximately 25% of patients had further dose adjustments following titration.

Please refer to page A189 for declarations of interest related to this abstract.

S80 THE DIAGNOSIS AND MANAGEMENT OF CATHETER-ASSOCIATED UPPER-EXTREMITY DEEP VENOUS THROMBOSIS (CA-UEDVT): A SYSTEMATIC REVIEW

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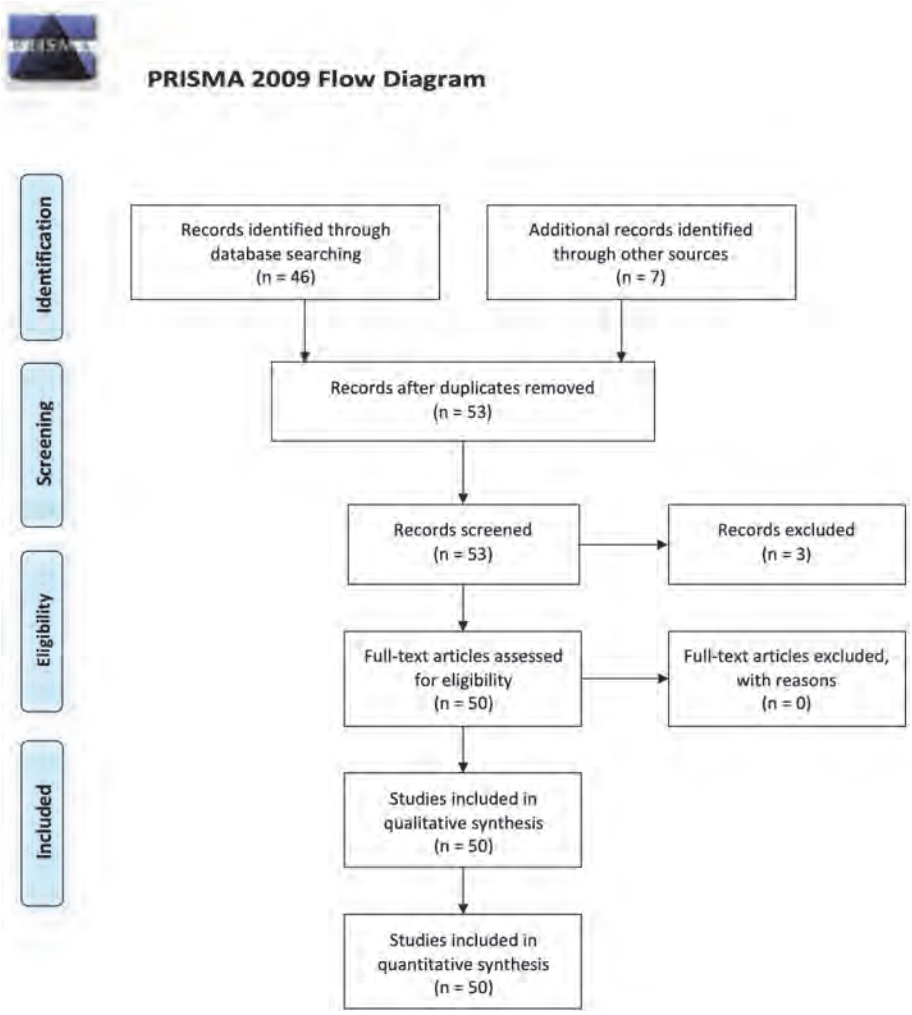
10.1136/thorax-2021-BTSabstracts.86

Introduction and Objectives Central venous catheters are a main risk factor for deep venous thrombosis of the upper extremity (UEDVT), with 93% of all UEDVTs being catheter-induced. Pulmonary embolism is an important sequela of DVT



Abstract S80 Figure 1

and albeit uncommon, remains a clinically significant cause of death with a mortality of up to 21.7 per 100,000 in the UK. In addition, 6% of pulmonary embolisms have an upper extremity source. We recognise the lack of official guidance on the diagnosis and management of CA-UEDVT. Herein, we aim to discuss the up-to-date management strategies for this prevalent condition.

Methods A systematic review was conducted according to PRISMA guidelines (search string: "catheter" AND "UEDVT") between 1997–2021 on PubMed. 53 manuscripts were screened by a single author (OA) on Rayyan and 50 were included in the final analysis. We extracted data on the institution, journal, citations, topic, sample size and outcomes.

Results Our results show that the commonest symptoms reported are ipsilateral upper extremity pain and/or discomfort, oedema, arm fatigue and discoloration at catheter entry site, but the majority of UEDVTs are asymptomatic. A high index of suspicion is therefore required.

For its diagnosis, venous duplex scan (VDS) is the commonest imaging modality used but it is less sensitive in paediatric patients and has limited use for central vasculature. In clinically suspected CA-UEDVT with negative VDS, contrast-venography – the gold-standard – can be used. It is, however, an invasive and technically complex procedure which requires use of contrast. For the management we recommend anticoagulation without removal of catheter for as long as catheter is in place and continued for at least three months after removal. (Low-molecular-weight-heparin in cancer patients and Direct-Oral-Anti-Coagulants in non-cancer patients unless contra-indicated). Consider removal if there is a catheter-associated infection, continuation of symptoms despite treatment and if the catheter is no longer functional or required. Finally, consider catheter-directed thrombolysis when indicated.

Conclusions Our findings provide a preliminary ground for further research into the diagnostic features of CA-UEDVT and may advise on the most up-to-date management algorithm for this condition.

S81 10 YEAR RETROSPECTIVE AUDIT FROM AMBULATORY PULMONARY EMBOLISM PATHWAY IN A TERTIARY HOSPITAL

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10.1136/thorax-2021-BTSabstracts.87

Introduction The suspicion of PE (Pulmonary embolism) is a common reason for hospital admission and hospital stays. Being able to prevent admission in low risk PE patients has previously shown to be safe and cost effective with an established ambulatory service running in our hospital since 2010.

Methods A 10 year retrospective analysis from June 2010 to January 2020 was carried out using the PE database. Patients with suspected PE referred to the service using acceptance criteria (appendix a). PE risk was then stratified using the PE severity index (PESI). D-dimers were performed in the low and intermediate probability groups. Those with negative d-dimers were discharged; those with high risk or positive d-dimer underwent imaging in the form of CT pulmonary angiography (CTPA) or ventilation-perfusion (VQ) scanning. This was generally a same day service.

Results Total number of patients referred to the service was 6434. 2825 (43%) were through bed bureau, 1491 (23%) through Clinical decisions unit, 732 (11%) though Emergency department and further 700 (10.8%) through other services.

From the total number of 6434, 3724 (58%) did not require any scans and were safely discharged from the service. CTPulmonary angiogram (CTPA) was performed in 2126 (33%) and Ventilation-Perfusion (V/Q) scans in 584 (9%). 2710 (42%) patients underwent scanning with 429 (15.8%) positive and 2281 (84%) were negative. 6112 (95%) of these patients were managed as outpatients. All patients were contacted by nurse led telephone follow-up, 1 week post diagnosis. Consultant led follow-up was variable, approximately 74% (321/429), due to multi-consultant service.

Conclusions Outpatient management of Pulmonary embolism is a safe and effective service.

S82 USING CARDIAC MAGNETIC RESONANCE IMAGING TO ASSESS CARDIAC GEOMETRY IN THE DIAGNOSIS OF CHRONIC THROMBOEMBOLIC DISEASE AND CHRONIC THROMBOEMBOLIC PULMONARY HYPERTENSION

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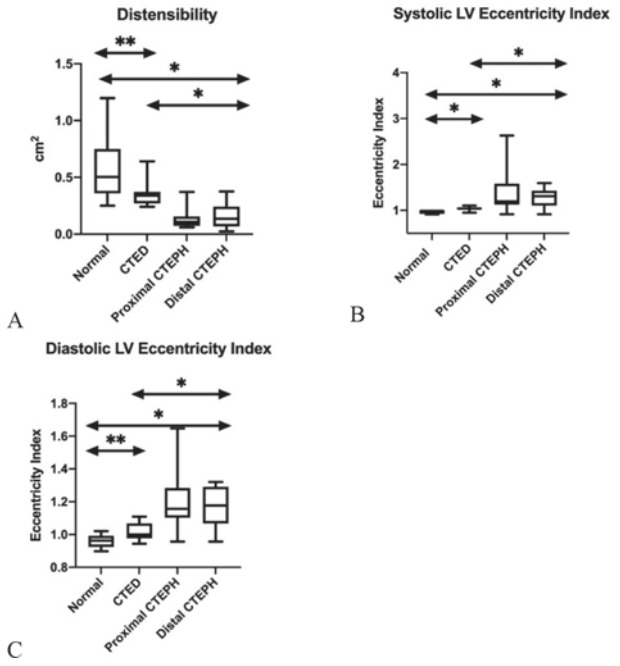
10.1136/thorax-2021-BTSabstracts.88

Background Cardiac magnetic resonance (CMR) imaging is the gold standard tool for evaluating the right ventricle (RV) in chronic thromboembolic disease (CTED) and chronic thromboembolic pulmonary hypertension (CTEPH). Ventricular septal flattening, reflecting RV pressure overload in idiopathic pulmonary arterial hypertension (IPAH) has been quantified using the eccentricity index (EI) with echocardiography and pulmonary artery distensibility (PAD) has been shown to correlate with pulmonary artery pressure. These have not been evaluated for use in CTEPH using CMR. We assessed them in the detection of CTED and CTEPH and correlated with haemodynamics.

Methods CMR and right heart catheterisation were performed on 30 patients with CTEPH and 20 sex-matched controls without resting pulmonary hypertension (10 patients with no thrombotic disease and 10 with CTED) at a national pulmonary hypertension centre. Mid-papillary short axis view was used to assess the eccentricity index at end-systole and end-diastole. Main PAD was measured using velocity-encoded CMR, perpendicular to pulmonary artery.

Results EI at end-systole and end-diastole were significantly increased in CTEPH compared to controls (1.3 (0.5)vs1.0 (0.01); $p \leq 0.01$ and (1.22 (0.2)vs0.98 (0.01); $p \leq 0.01$, respectively). PAD was significantly reduced in CTEPH compared to controls (0.13 (0.1) vs 0.46 (0.23); $p \leq 0.01$). End-systolic EI and end-diastolic EI significantly correlated with pulmonary vascular haemodynamic indices, including mean pulmonary arterial pressure, cardiac output and with NTproBNP. End-systolic and End-diastolic EI correlated with exercise capacity as measured by 6-minute walk distance, and with pulmonary artery distensibility (R-value 0.8). Using ROC curves, an optimal threshold of 1.1 for both end-diastolic and end-systolic indices identified the presence of pulmonary hypertension. Both EI and PAD were able to differentiate the presence of CTED from normal.



Abstract S82 Figure 1 MRI indices in patients with no pulmonary vascular obstruction, CTED, proximal and distal CTEPH
P-value = ANOVA
*p = <0.01 **p = <0.05, ns = not significant
A – Pulmonary Artery Distensibility, B – Systolic Left Ventricular EI, C – Diastolic Left Ventricular EI

Conclusion EI and PAD correlate with invasive haemodynamic indices and right ventricular function in CTEPH. These measures strengthen the ability of CMR to detect pulmonary hypertension and provide further justification for the use of CMR in investigation of chronic thromboembolic disease.

Biologics for asthma

S83 THE IMPACT OF AN ONLINE PATIENT-FACING TOOL ON SEVERE ASTHMA REFERRALS

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10.1136/thorax-2021-BTSabstracts.89

Introduction Biologics for severe asthma (SA) are effective but only 18% of people with suspected SA are referred for consideration for treatment as recommended by current BTS asthma guidelines.[1] Awareness of biologics among people with asthma is low. Here we evaluate the impact of a patient-facing intervention designed to drive appropriate SA referrals in the UK.

Methods Asthma UK (AUK) designed an interactive online tool that directs people to one of 5 possible outcomes, including 'improve asthma management', 'seek referral' or 'explore biologic options'. Each outcome has a clear call to action and option to sign up for tailored health advice emails. The tool was developed based on the Asthma Control Questionnaire (ACQ) and service specification for SA. The tool was created using an online survey platform (Typeform) and embedded on the AUK website. Usability of the tool was evaluated via moderated online video interviews with 12 patients with asthma. Respiratory clinicians were also invited to use the tool and provide feedback. It was promoted to people with uncontrolled asthma via AUK emails, social media and within the press. A follow-up survey was administered six weeks later to understand how people acted on the advice provided.

Results As of April 2020, 20,000 people had used the interactive tool. Of those that signed up for the tailored email, 313 completed the 'improve asthma management', 'seek referral' or 'explore biologic options' follow-up survey. Overall, 70% (218/313) said they took action based on their outcome from the tool. Of those completing the 'seek referral' survey, 60% (55/91) said they spoke to their GP about a referral and 30% (27/91) were referred. Of those completing the 'explore biologic options' survey, 39% (15/38) spoke to their healthcare professional about their eligibility and 21% (8/38) said they were assessed for treatment with biologics. Of those completing the 'improve asthma management' survey, 80% (148/184) said they took steps to improve their asthma management.

Conclusion Preliminary results suggest that AUK's interactive patient facing tool helps to increase SA referrals and access to biologic treatments.

REFERENCE

1. Asthma UK, Living in Limbo: the unmet need in difficult and severe asthma, 2019.

S84 LONG-TERM EFFICACY OF DUPILUMAB: 3-YEAR DATA OF QUEST PATIENTS WITH MODERATE-TO-SEVERE ASTHMA ENROLLED IN LIBERTY ASTHMA TRAVERSE

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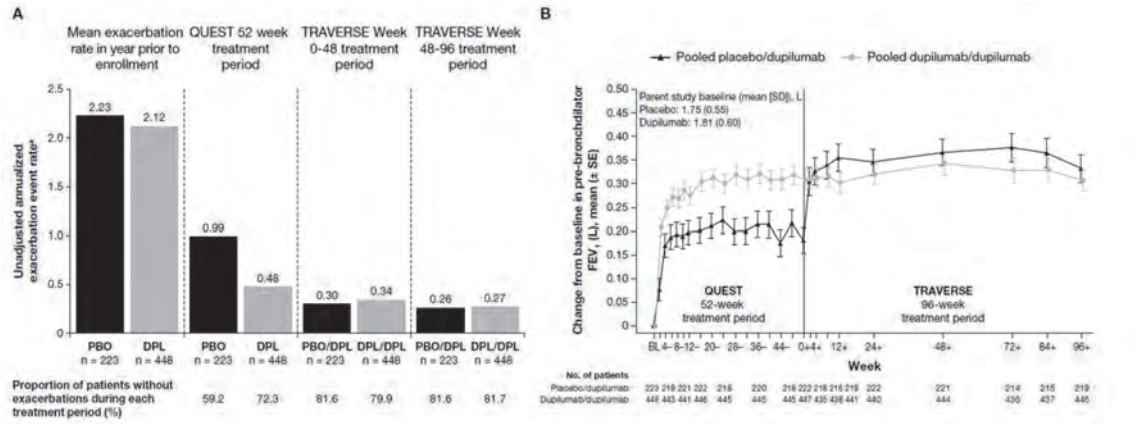
10.1136/thorax-2021-BTSabstracts.90

Introduction and Objectives Dupilumab, a fully human monoclonal antibody, blocks the shared receptor component for interleukin-4 and interleukin-13, key and central drivers of type 2 inflammation in multiple diseases, including asthma. In the phase 3 LIBERTY ASTHMA QUEST study (NCT02414854), add-on dupilumab 200/300 mg every 2 weeks (q2w) significantly reduced severe asthma exacerbations and improved pre-bronchodilator forced expiratory volume in 1 second (FEV_1) vs matched placebo in patients with uncontrolled, moderate-to-severe asthma. The LIBERTY ASTHMA TRAVERSE open-label extension study (NCT02134028) evaluated the long-term safety, tolerability, and efficacy of dupilumab in patients who had completed a previous dupilumab asthma study. This post hoc analysis evaluated the efficacy of dupilumab in patients from QUEST who rolled over into TRAVERSE and received a further 96 weeks of dupilumab treatment.

Methods We evaluated data from QUEST patients treated with dupilumab q2w or matched placebo for 52 weeks who rolled over into TRAVERSE and received 96 weeks of dupilumab



Abstract S84 Figure 1 Efficacy endpoints in QUEST patients who rolled over into TRAVERSE completing 3 full years of dupilumab treatment. (A) Unadjusted; (B) Change from QUEST baseline in FEV_1
(A) AER analysis in blinded parent study was done on ITT and in the open label TRAVERSE was done on the safety population.
(B) FEV_1 was assessed in the exposed population (observed cases) using descriptive statistics. BL represents the baseline of the parent study. Week 0 represents the start of TRAVERSE, and Week in TRAVERSE refers to the time in TRAVERSE without regard to any time in any parent study.
[a]The total number of events that occurred during the treatment period divided by the total number of patient-years followed in the treatment period.
BL, baseline; ITT, intention-to-treat; SD, standard deviation; SE, standard error.

300 mg q2w. We assessed the unadjusted annualized rate of severe asthma exacerbations (AER) during QUEST (Weeks 0–52) and TRAVERSE (Weeks 0–48 and Weeks 48–96) and the mean change from QUEST baseline in pre-bronchodilator FEV_1 in QUEST over the QUEST and TRAVERSE studies.

Results The unadjusted AER in dupilumab-treated patients was low during QUEST, with progressive reductions observed during the treatment period of 96 weeks in TRAVERSE and a majority of patients experiencing no exacerbations (figure 1A). In the placebo/dupilumab group of patients, the unadjusted AER decreased significantly during TRAVERSE compared with QUEST and was similar to the AER in dupilumab/dupilumab patients. Clinically meaningful improvements in pre-bronchodilator FEV_1 were observed at Week 52 of QUEST in dupilumab/dupilumab patients, which were sustained with no apparent loss of treatment effect at Weeks 48 and 96 of TRAVERSE (figure 1B). Large improvements in pre-bronchodilator FEV_1 were observed in placebo/dupilumab patients upon initiation of dupilumab, which were sustained throughout the TRAVERSE treatment period.

Conclusions Dupilumab demonstrated sustained efficacy in reducing severe asthma exacerbations and improving lung function in patients with moderate-to-severe asthma who completed 96 weeks of treatment.

Please refer to page A189 for declarations of interest related to this abstract.

S85 CLINICAL CHARACTERISTICS ASSOCIATED WITH MUCUS PLUGGING IN SEVERE EOSINOPHILIC ASTHMA AND THE EFFECTIVENESS OF BENRALIZUMAB TREATMENT

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10.1136/thorax-2021-BTSabstracts.91

Background Eosinophil-rich mucus plugs are a recognised feature of asthma and are believed to contribute to airflow obstruction. However, little is known about the incidence of plugging in severe eosinophilic asthma (SEA) and the relationship of plugging to other characteristics of this phenotype. In addition, it is unknown whether patients with evidence of plugging have a differential response to the eosinophil depleting anti-IL-5R therapy benralizumab.

Methods Pre-biologic CT scans of patients with SEA treated with benralizumab were assessed by two radiologists independently. Patients were given a mucus score out of 20 (per segment plugged; score of 1–3 classed as plugging-low, score ^{3}4 as plugging-high). Baseline characteristics and clinical outcome following 1 year of treatment was compared between patients with and without evidence of plugging.

Results CT scans of 116 patients with SEA were reviewed. 69/116 (59.5%) exhibited mucus plugging of which 40/116 (34.5%) were classed as plugging-high. Median (IQR) number of segments plugged was 4 (2–10.5). Baseline characteristics were similar between the plugging and no-plugging groups, with a trend towards lower baseline FEV1 in the plugging group (p=0.06). Nasal polyposis was more frequent in the plugging-high group (45%) compared to plugging low (24%) and unplugged (21%) groups (ANOVA p=0.04). Response to benralizumab at 1 year was comparable between those with and without plugging: AER reduction 3.67+/- 4.1 vs 3.17+/- 3.47; change in ACQ6 0.73+/-1.1 vs 0.77+/-1.38; change in FEV1% 6.72+/-17.35 vs 6.50+/-18.3 (all p=NS). The number of plugged segments at baseline did not correlate with improvement in FEV1.

Discussion Mucus plugging is identified in 60% of patients with SEA and is more commonly seen at high levels in patients with co-morbid nasal polyposis. Individuals with SEA and mucus plugging have a similar clinical response to eosinophil targeted therapy with benralizumab compared to patients with SEA but absent plugging on CT imaging.

Abstract S85 Table 1 Baseline Characteristics

	Whole cohort n=116	Plugged n=69	No Plugging n=47	Plugging low n=29	Plugging High n=40	P value plugged vs unplugged	P value across plugging groups
Female	73	44	29	14	30	0.82	0.07
N (%)	(62.9)	(63.8)	(61.7)	(48.3)	(75)		
Age	52.3	53.94	49.96	55	53.18	0.10	0.22
Mean (SD)	(12.8)	(13.2)	(11.8)	(12.9)	(13.6)		
BMI	31.3	31.0	31.7	30.5	31.3	0.59	0.78
Mean (SD)	(7.2)	(6.6)	(8.0)	(6.4)	(6.7)		
AER	4.8	4.7	4.9	4.6	4.8	0.67	0.83
Mean (SD)	(3.3)	(3.0)	(3.9)	(3.0)	(3.0)		
mOCS	64	39	25	17	22	0.72	0.90
N (%)	(55.2)	(56.5)	(53.2)	(58.6)	(55.0)		
Peak Eosinophil	0.6	0.6	0.6	0.6	0.7	0.40	0.45
Count	(0.4 - 0.9)	(0.5–0.9)	(0.4–0.8)	(0.5–0.7)	(0.5–1.0)		
Median (IQR)							
FENO ppb	44	44	47	62	38.5	0.74	0.3
Median (IQR)	(25–78)	(27–83)	(23–67)	(26–93)	(27.5–58.5)		
Adult onset	59	37	22	15	22	0.47	0.74
N (%)	(50.9)	(53.6)	(46.8)	(51.7)	(55.0)		
Atopy	86	47	39	18	29	0.07	0.12
N (%)	(74.1)	(68.1)	(83.0)	(62.1)	(72.5)		
Nasal Polyps	35	25	10	7	18	0.08	**0.04**
N (%)	(30.2)	(36.2)	(21.3)	(24.1)	(45.0)		
FEV1 Litres	1.7	1.6	1.86	1.6	1.6	0.06	0.17
Mean (SD)	(0.7)	(0.6)	(0.7)	(0.7)	(0.7)		
FEV1% Predicted	61.7	59.6	64.8	58.5	60.4	0.20	0.42
Mean (SD)	(21.6)	(19.8)	(30.0)	(21.3)	(18.9)		
ACQ-6	2.9	2.8	3.2	2.9	2.7	0.12	0.26
Mean (SD)	(1.4)	(1.4)	(1.3)	(1.4)	(1.4)		
Mini-AQLQ	3.3	3.3	3.2	3.0	3.6	0.68	0.25
Mean (SD)	(1.7)	(1.7)	(1.8)	(1.8)	(1.5)		
Non-Smokers	77	42	35	15	27	0.19	0.24
N (%)	(66.4)	(60.9)	(74.5)	(15.7)	(67.5)		
Ex-Smokers	37	26	11	14	12		
N (%)	(31.9)	(37.7)	(23.4)	(48.3)	(30)		
Current Smokers	1	1	0	0	1		
N (%)	(0.9)	(1.4)			(2.5)		

For normally distributed data, number quoted is mean (standard deviation). For non-parametric variables, number quoted is median (inter-quartile range).
Abbreviations: ACQ6 = Asthma Control Questionnaire 6; Receptor; BMI = Body Mass Index; FeNO = Fractional exhaled Nitric Oxide; FEV1 = Forced Expiratory Volume in 1 second; mOCS = maintenance Oral Corticosteroid; Mini-AQLQ = Mini Asthma Quality of Life Questionnaire; ppb = parts per billion;

S86

LONG-TERM ASSESSMENT OF EXACERBATIONS AND LUNG FUNCTION IN THE LIBERTY ASTHMA TRAVERSE STUDY, STRATIFIED BY LUNG FUNCTION IMPROVEMENTS AT THE END OF THE PHASE 3 LIBERTY ASTHMA QUEST PARENT STUDY

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Introduction and Objectives Low pre-bronchodilator FEV_1 in asthma patients is associated with increased exacerbations and lung function decline. Dupilumab, a fully human monoclonal antibody, blocks the shared receptor component for interleukin-4 and interleukin-13, key and central drivers of type 2 inflammation in multiple diseases. TRAVERSE (NCT02134028), a single-arm, open-label extension study, evaluated long-term safety, tolerability, and efficacy of dupilumab added to standard of care in adult/adolescent patients continuing from a previous dupilumab asthma study. Post-hoc analysis of TRAVERSE patients enrolled from QUEST (NCT02414854) with baseline blood eosinophils $\geq$150 cells/μL or FeNO $\geq$25 parts per billion assessed the relationship of lung function (characterized by baseline and change in pre-bronchodilator FEV_1 and FEV_1:forced vital capacity [FVC] ratio) on severe exacerbation rate (AER).

Methods Patients with increased type 2 inflammatory biomarkers who participated in QUEST (52 weeks) and continued to TRAVERSE (up to 96 weeks) were stratified by pre-bronchodilator FEV_1 improvement at Week 52 of QUEST. Endpoints assessed were exacerbation history in the year before QUEST; annualized AER during QUEST and

TRAVERSE; change from QUEST baseline in pre-bronchodilator FEV1 in QUEST and TRAVERSE and FEV_1:FVC in TRAVERSE; and proportion of patients who maintained pre-bronchodilator FEV_1 improvements at Week 52 in QUEST during TRAVERSE.

Results Of 1,227 type 2 QUEST patients, 102 (8%) and 661 (54%) achieved <100 and ≥100mL improvement in pre-bronchodilator FEV_1 at Week 52, respectively. Of these, 556 patients achieved improvements of ≥200mL. Patients with greater improvements in pre-bronchodilator FEV_1 by the end of QUEST experienced long-term enhanced AER reductions (≥100mL: 0.202; ≥200mL: 0.180) and FEV_1 and FEV_1:FVC improvements during Weeks 48–96 in TRAVERSE. Patients with <100mL improvement in QUEST also showed benefits of dupilumab treatment during TRAVERSE (unadjusted AER: 0.216, Weeks 48–96) (table 1). Dupilumab-treated patients

Abstract S86 Table 1 Efficacy endpoints during QUEST and TRAVERSE in type 2 QUEST patients stratified by level of pre-bronchodilator FEV_1 improvement at Week 52 of QUEST

	<100mL improvement		≥100mL improvement		≥200mL improvement	
	Combined PBO	Combined DPL	Combined PBO	Combined DPL	Combined PBO	Combined DPL
Number of severe asthma exacerbations[a] experienced in the year prior to QUEST (exacerbation history)						
N	32	70	199	462	158	398
Mean (SD)	2.19 (1.97)	1.96 (1.71)	2.27 (1.97)	2.09 (2.00)	2.20 (1.85)	2.12 (2.10)
Adjusted annualized event rate of severe exacerbation[a] during 52-week treatment period of QUEST[b]						
Patients with ≥1 severe exacerbation events, n (%)	12(37.5)	18 (25.7)	72(36.2)	109 (23.6)	53 (33.5)	94(23.6)
Estimate	0.690	0.481	0.679	0.331	0.704	0.331
Relative risk (95% CI) vs matching placebo	0.697 (0.291, 1.667)		0.487 (0.355, 0.669)		0.471 (0.330, 0.673)	
	P = 0.4134		*P* < 0.0001		*P* < 0.0001	
Unadjusted annualized event rate of severe exacerbation[a] by year during treatment period of TRAVERSE[c]						
	PBO/DPL	DPL/DPL	PBO/DPL	DPL/DPL	PBO/DPL	DPL/DPL
Patients with ≥1 severe exacerbation events, Weeks 0–48, n/N (%)	8/32 (25.0)	17/70 (24.3)	31/198 (15.7)	74/463 (16.0)	19/157 (12.1)	60/399(15.0)
	0.417	0.360	0.222	0.257	0.188	0.239
Patients with ≥1 severe exacerbation events, Weeks 48–96, n/N (%)	5/29 (17.2)	6/58 (10.3)	17/167 (10.2)	35/387 (9.0)	13/127 (10.2)	27/335(8.1)
	0.359	0.216	0.186	0.202	0.175	0.180
	Combined PBO	Combined DPL	Combined PBO	Combined DPL	Combined PBO	Combined DPL
Pre-bronchodilator FEV_1 (L) at baseline in QUEST						
Mean (SD)	1.65 (0.36)	1.82 (0.65)	1.76 (0.58)	1.78 (0.60)	1.79 (0.60)	1.78 (0.60)
Change from baseline in pre-bronchodilator FEV_1 (L) in QUEST[d]						
Week 12: LS mean (SE)	0.16 (0.03)	0.16 (0.02)	0.34 (0.03)	0.51 (0.02)	0.40 (0.03)	0.57 (0.02)
Difference vs PBO (95% CI)	0.01 (–0.07, 0.08)		0.17 (0.10, 0.23)		0.16 (0.09, 0.24)	
	P = 0.8792		*P* < 0.0001		*P* < 0.0001	
Week 52: LS mean (SE)	0.06 (0.03)	0.07 (0.02)	0.47 (0.03)	0.60 (0.02)	0.55 (0.03)	0.67 (0.02)
Difference vs PBO (95% CI)	0.01 (–0.07, 0.08)		0.13 (0.07, 0.19)		0.12 (0.06, 0.18)	
	P = 0.8170		*P* < 0.0001		*P* = 0.0002	
Change from baseline in pre-bronchodilator FEV_1 (L) in TRAVERSE[d]						
	PBO/DPL	DPL/DPL	PBO/DPL	DPL/DPL	PBO/DPL	DPL/DPL
Week 48: LS mean (SE)	0.22 (0.04)	0.04 (0.03)	0.58 (0.03)	0.60 (0.02)	0.65 (0.03)	0.66 (0.02)
P vs PBO/DPL	*P* = 0.0009		*P* = 0.6657		*P* = 0.7457	
Week 96: LS mean (SE)	0.22 (0.06)	0.03 (0.04)	0.54 (0.03)	0.56 (0.02)	0.60 (0.04)	0.61 (0.03)
P vs PBO/DPL	*P* = 0.0063		*P* = 0.6242		*P* = 0.7336	
	Combined PBO	Combined DPL	Combined PBO	Combined DPL	Combined PBO	Combined DPL
Pre-bronchodilator FEV_1/FVC (%) at baseline in QUEST						
Mean (SD)	59.31 (10.94)	64.16 (9.37)	62.27 (9.92)	62.74 (10.80)	62.19 (9.89)	62.41 (10.96)
Change from baseline in pre-bronchodilator FEV_1/FVC (%) in TRAVERSE[e]						
	PBO/DPL	DPL/DPL	PBO/DPL	DPL/DPL	PBO/DPL	DPL/DPL
Week 48: LS mean (SE)	4.91 (1.02)	1.53 (0.75)	7.06 (0.46)	6.69 (0.31)	7.64 (0.53)	7.40 (0.34)
P vs PBO/DPL	*P* = 0.0055		*P* = 0.4869		*P* = 0.6877	
Week 96: LS mean (SE)	6.00 (0.97)	2.10 (0.72)	7.13 (0.52)	6.83 (0.35)	7.48 (0.58)	7.44 (0.37)
P vs PBO/DPL	*P* = 0.0008		*P* = 0.6147		*P* = 0.9564	

[a]Defined as any treatment with ≥1 systemic (oral or parenteral) steroid bursts for worsening asthma or hospitalization or an emergency/urgent medical care visit for worsening asthma. [b]Derived using negative binomial model with the total number of events onset from randomization up to Visit 18 or last contact date as the response variable; with treatment group, age, region (pooled country), baseline eosinophil strata, baseline ICS dose level, and number of severe exacerbation events within 1 year prior to the study as covariates; and log-transformed standardized observation duration as an offset variable. [c]Total number of events that occurred during the observational period divided by the total patient-years followed in the observational period. [d]Derived using mixed-effect models with repeated measures with change from baseline in pre-bronchodilator FEV_1 values up to Week 52/96 as the response variable; and treatment, age, sex, baseline height, region, baseline eosinophil strata/levels subgroups (<0.3 Giga/L, ≥0.3 Giga/L), baseline ICS dose level, visit, treatment-by-visit interaction, baseline pre-bronchodilator FEV_1 value, and baseline-by-visit interaction as covariates. [e]Derived using mixed-effect models with repeated measures with change from baseline in FEV1/FVC values up to Week 96 as the response variable; and treatment, age, sex, baseline height, region, baseline eosinophil strata/levels subgroups (<0.3 Giga/L, ≥0.3 Giga/L), baseline ICS dose level, visit, treatment by-visit interaction, baseline FEV1/FVC value, and baseline-by-visit interaction as covariates. CI, confidence interval; DPL, dupilumab; FVC, forced vital capacity; ICS, inhaled corticosteroid; LS, least square; PBO, placebo; SD, standard deviation; SE, standard error.

with higher pre-bronchodilator FEV_1 improvement at end of QUEST experienced fewer exacerbations during both studies. Over 80% of patients who achieved ≥100mL or ≥200mL pre-bronchodilator FEV_1 improvements at the end of QUEST maintained these improvements in TRAVERSE.
Conclusions Greater improvements in pre-bronchodilator FEV_1 in QUEST led to long-term enhanced benefits of dupilumab treatment; patients maintained these improvements and had fewer exacerbations during TRAVERSE.

Please refer to page A189 for declarations of interest related to this abstract.

S87 SEVERE ASTHMA OUTCOMES WHEN SWITCHING FROM MEPOLIZUMAB TO BENRALIZUMAB IN NON-RESPONDERS WITH PERSISTENT SPUTUM EOSINOPHILIA

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Background Anti-IL-5 monoclonal antibodies reduce systemic corticosteroid use and exacerbation rate in severe eosinophilic asthma. Although their specific mechanisms of action differ, there is as yet no guidance on whether to choose mepolizumab or benralizumab for any given patient.
Aims To investigate clinical outcomes of patients switching to benralizumab after non-response to mepolizumab associated with persistent sputum eosinophilia.
Methods We recruited patients who failed to respond to mepolizumab over 12 months (no meaningful reduction in maintenance steroid use and/or exacerbation rate), with sputum eosinophils above the threshold of 2%.

Over the subsequent 12 months of benralizumab treatment we recorded daily prednisolone dose, ACQ6, AQLQ, and sputum & blood eosinophils. Lung function and FeNO testing was severely impacted by the COVID pandemic.
Results Fifty-three of 165 (32%) mepolizumab patients were identified as candidates for a switch of therapy with residual positive sputum eosinophils, of which 36 have completed 12 months of treatment, 20 with available sputum eosinophil results. Five patients stopped therapy before a full year (two for failure to respond to treatment at 6–9 months, one allergic reaction, two unspecified).

Abstract S87 Table 1

Clinical parameter Median (IQR) or mean (SD)	n	Prior to benralizumab	12 months benralizumab	Paired test *p* value
OCS δ mg/d, median (IQR)	33	4 (10)	5 (7.5)	0.101
Annual exacerbations δ, mean (SD)	25	4.5 (5.5)	2 (5)	0.010
Sputum % eosinophils δ, median (IQR)	20	8.5 (15)	0 (0)	<0.001
ACQ6 δ, mean (SD)	33	2.8 (1.7)	2.3 (1.5)	0.046
AQLQ β, mean (SD)	28	3.3 (1.8)	4.0 (2.1)	0.033
ICS δ mcg BDP equivalent / d, median (IQR)	33	2000 (1200)	1840 (400)	0.753
Blood eosinophils β 10*9cells/ml- median (IQR)	30	0.09 (0.11)	0 (0.00)	0.001

Clinical parameters measured at time of decision to switch from mepolizumab or benralizumab (δ) or benralizumab baseline visit (β) and after 12 months on benralizumab.

After 12 months on benralizumab, all patients had negative sputum eosinophils as well as improvements in ACQ6, AQLQ, blood eosinophils and reduced exacerbation rate compared to before switching (table 1).
Conclusions Around a third of patients failed to respond to mepolizumab and displayed persistent airway eosinophilia. All of these patients had complete suppression of sputum eosinophils on benralizumab with significant clinical improvements in exacerbation rate, blood eosinophils, asthma control and quality of life. These real-life observations in our severe asthma patient population confirm the results of the SIROCCO and Calima trials.

S88 USE OF A CONNECTED INHALER SYSTEM IN THE PRE-BIOLOGIC ASSESSMENT OF PATIENTS WITH SEVERE ASTHMA

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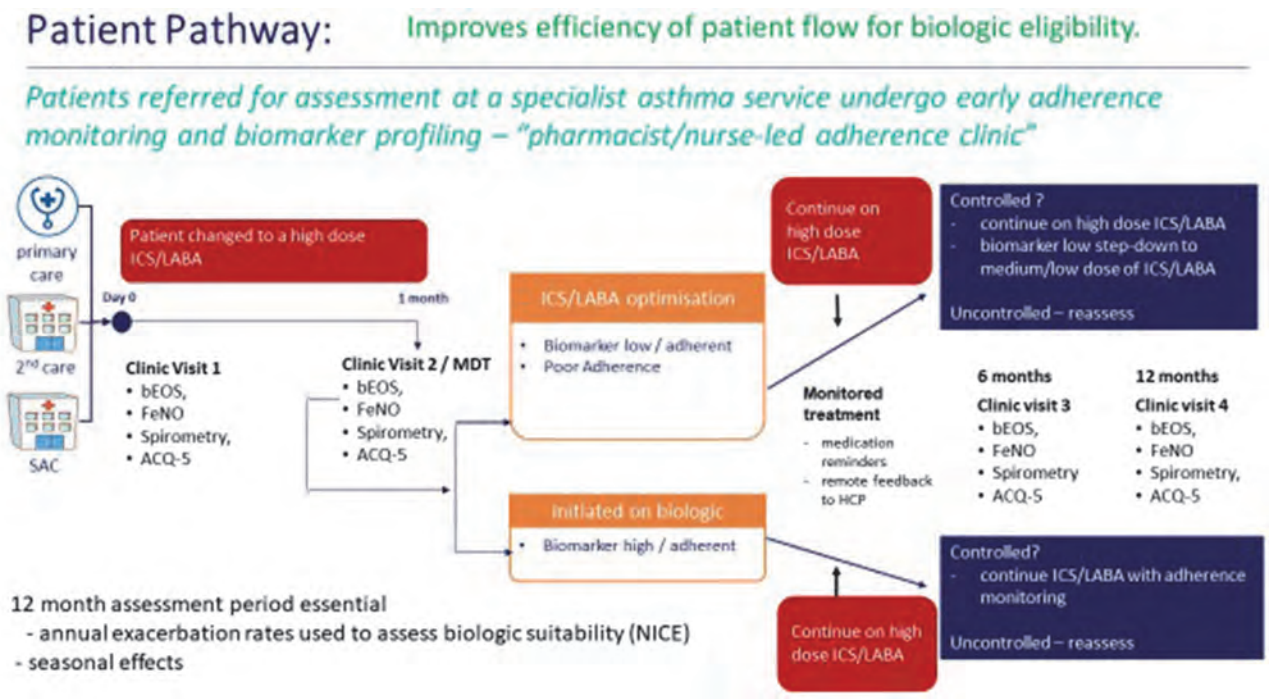
10.1136/thorax-2021-BTSabstracts.94

Background Sub-optimal adherence is a significant factor in patients with difficult to treat asthma. Aligning adherence to maintenance inhaled corticosteroid (ICS) treatment with digital inhaler monitoring and measurement of fractional exhaled nitric oxide (FeNO suppression) can rapidly differentiate patients with poor adherence from those who require treatment escalation with type-2 biologic therapy.[1]
Objectives To assess the feasibility and utility of monitoring adherence using a digital connected inhaler system (CIS) embedded within the patient pathway as a service evaluation, to rapidly identify patients for initiation of biologic therapies in UK specialist severe asthma clinics n=7).
Methods Using a CIS (Propeller Health) patients completed adherence monitoring/biomarker profiling for 1 month as part of a pre-biologic assessment followed by clinical decision (initiate biologic therapy or continue monitoring – figure 1). Patients had the following assessments at baseline and 1 month follow-up: spirometry, FeNO, peripheral blood eosinophil count and asthma control questionnaire (ACQ-7).
Results To date, 104 patients have been initiated on the CIS with 43 having outcome data at 3 months. In FeNO-high subjects (FeNO≥45 ppb, n=26) median adherence was 100% (range 57 – 100%) and there were significant reductions in ACQ-7 (2.88 vs 2.14, p = 0.03) and FeNO (63ppb vs 32ppb, p < 0.001) between baseline and 1 month follow-up. In patients with positive FeNO suppression[1] (n=16), 14 maintained good adherence with no rescue prednisolone, 2 were commenced on a biologic therapy and 2 had persistent poor adherence. In those with negative FeNO suppression[1] (n=10), 6 were commenced on a biologic therapy at 3 months, with 4 having good adherence with ongoing monitoring. In FeNO-low subjects (FeNO<45 ppb, n=17), median adherence was 100% (range 85 – 100%) but no differences in parameters were seen at 1 month, consistent with previous data supporting this 'cut-point' to identify difficult to treat asthma patients with poor ICS adherence.[1]
Conclusion Using a CIS in conjunction with FeNO monitoring is a useful method for assessing adherence to ICS when



Abstract S88 Figure 1

assessing patient suitability for biologic asthma therapies and to support adherence in routine care.

REFERENCE

1. Heaney, *et al*. (RASP-UK) *Am J Respir Crit Care Med* 2019;**199**(4):454–464.

Please refer to page A190 for declarations of interest related to this abstract.

New insights into airways disease

S89 COMPARISON OF THE LUNG MICROBIOME IN CHRONIC OBSTRUCTIVE PULMONARY DISEASE AND IN HEALTH: AN IN SILICO STUDY

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A number of clinical studies have defined the lung microbiome of chronic obstructive pulmonary disease (COPD) patients. However, these studies are limited by several factors such as cohort size, lack of standardised processing and analysis methods as well as being confined to a single geographic location. Herein, a meta-analysis of publically available COPD microbiome data was performed. Search criteria to select for next generation sequencing (NGS) studies were formed to select for publications studying the microbiome in COPD and in health. This returned 686 studies, which was narrowed down to 60 relevant studies. Relevant studies were subjected to scoring criteria to determine data quality. Eighteen studies from across Europe, North America and Asia were identified as high-quality studies and sequencing data was retrieved and analysed using standardised methods. Quality control, read trimming and processing was performed using Qiime2 and imported to R for manipulation and visualisation. Geographical location of the study and 16S target region were found to have the largest influence on the lung microbiome. Interestingly, bacterial diversity was found to be markedly increased in COPD samples when compared to healthy subjects, which was associated with an overgrowth of pathogens, such as *Haemophilus*, and a decrease in commensal organisms. The abundance of several genera such as *Moraxella* and *Veillonella* were also found to be significantly increased in COPD patients, proposing potential markers for COPD diagnosis. The level of abundance of these genera have potential to be used as defining criteria in the diagnosis of COPD. In conclusion, this meta-analysis provides detailed insight into the composition of the lung microbiome in COPD, highlighting the importance and benefits of utilising publically available data to build upon our current understanding of COPD and disease biology.

S90 COMPREHENSIVE MULTIOMICS ANALYSIS DEMONSTRATES SURFACTANT DYSREGULATION IN COPD

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10.1136/thorax-2021-BTSabstracts.96

Introduction and Objectives Pulmonary surfactant homeostasis is critical to lung function as it coats the vast air-liquid

interface, reducing surface tension and preventing alveolar collapse. surfactant proteins (SP)-A and D play essential anti-pathogenic defence and immunoregulation roles to maintain lung homeostasis. SP-D is reduced in COPD. We hypothesised lipid and protein surfactant dysregulation could contribute to pathological COPD mechanisms, this requires detailed characterisation.

Methods We conducted mass spectrometry-based multiomic (proteomic, lipidomic and metabolomic) analysis of bronchoalveolar lavage to comprehensively characterize surfactant dysregulation in a well-characterised ex-smoking mild/moderate COPD cohort (n=31), with median (IQR) age of 70 (9.5) and FEV1% predicted 73 (21), compared with healthy ex-smoking volunteers (n=20), with age 67.5 (6.75) and FEV1% predicted 100.5 (11.75). To identify the multiomic signatures of COPD, we fitted linear mixed-effects models to the data, accounting for the effects of confounding variables, such as age, gender and individual differences simultaneously. We further characterised purified alveolar macrophage gene expression differences.

Results SP-A, SP-B, and SP-D levels were lower in COPD vs control with log2fold changes (FC) of -0.7 ($p=1.1x10^{-6}$), -0.6 ($p=4.8x10^{-6}$) and -0.6 ($p=3.0x10^{-5}$), and showed positive correlations of 0.65 ($p=1.5x10^{-12}$), 0.62 ($p=7.7x10^{-11}$) and 0.43 ($p=2.3x10^{-4}$) with lung function (FEV1/FVC), respectively. SP-C was below detection limit. NAPSA and CTSH, responsible for SP-B synthesis, were lower in COPD, log2FC of -0.1 ($p=2.8x10^{-6}$) and -0.4 ($p=4.3x10^{-4}$), respectively. Fatty acid binding protein 4 (FABP4) and CD44, involved in surfactant regulation, were decreased in COPD, log2FC of -0.4 ($p=8.0x10^{-3}$) and -0.7 ($p=1.1x10^{-5}$), respectively. Histamine and hypoxanthine metabolites were increased in COPD, log2FC of 0.8 ($p=2.5x10^{-2}$) and 1.0 ($p=4.0x10^{-2}$), respectively, which could indicate immune-dysregulation and inflammation. Surfactant lipid levels were decreased in COPD, specifically, PC, PG, and PI, log2FC of -2.1 ($p=2.6\times10^{-7}$), -2.4 ($p=5.3\times10^{-8}$) and -1.5 ($p=9.0\times10^{-6}$), respectively.

Conclusions We used a multiomics approach to comprehensively describe surfactant dysregulation in a well-characterised COPD cohort, with an aim to generate novel insights into key aspects of this biology within the COPD lung. Further mechanistic studies could help to understand the role this plays in pathological mechanisms and allow novel therapeutic target identification.

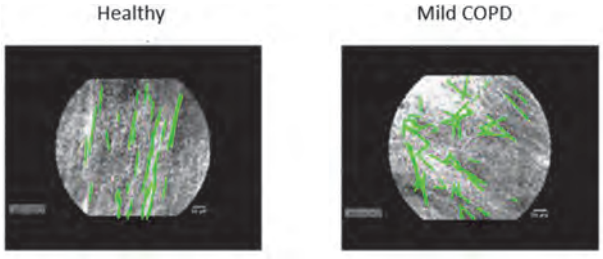
Please refer to page A190 for declarations of interest related to this abstract.

S91 GATEWAY TO THE HIDDEN ZONE: USING PCLE TO STUDY RELATIONSHIPS BETWEEN ELASTIN REMODELLING AND SMALL AIRWAYS DISEASE IN THE COPD LUNG

[1]KCW Kong, [1]M Bennett, [1]T Havelock, [2]K Ostridge, [1]CM Spalluto, [1]T Wilkinson. *[1]Southampton NIHR Respiratory Biomedical Research Unit, University Hospital Southampton, Southampton, UK; [2]Translational Science and Experimental Medicine, Research and Early development, Respiratory and Immunology, RandD BioPharmaceuticals, Astrazeneca, Gothenburg, Sweden*

10.1136/thorax-2021-BTSabstracts.97

Introduction Small airways disease (SAD) is a hallmark of COPD and often precedes the development of airflow obstruction and clinically evident emphysema. SAD requires study however, this has been complicated by the absence of direct sampling and imaging techniques and is beyond the resolution of CT. Probe-based confocal laser endomicroscopy (pCLE) produces fluorescence images of tissue obtained in vivo during endoscopy. pCLE can image extra-cellular matrix (ECM) remodelling in the submucosa of airway walls. We developed imaging and analysis techniques and used these to describe the ECM remodelling and relationships to features of SAD and early COPD.



Abstract S91 Figure 1 Examples of the analysis output, with detected elastin fibres in green

Methods We performed pCLE-bronchoscopy to directly visualise the airways in 8 never smokers (mean [+/- SD] age, 48 +/- 8), 8 smokers with normal spirometry (mean [+/- SD] age, 55 +/- 5) and 12 patients with COPD (mean [+/- SD] age, 61 +/- 4, mean [+/- SD] FEV1%, 83.5% +/- 13.5). Alveolar opening dimensions were measured, and the structural disorder caused by the remodelling process was objectively quantified and expressed as an elastin linearity score (ELS) using novel quantitative image analysis software.

Results COPD was associated with larger mean alveolar opening diameter (350.1μm ± 15.1 vs 289.8μm ± 21.6, p = 0.000) and greater cross-sectional area.

There was greater disorder of airway elastin fibre alignment, even in mild COPD (mean [± SD] ELS, 54.9 ± 6 vs 44.7 ± 9, p = 0.002). ELS was inversely correlated with several lung function and CT imaging parameters including FEV1% (r = -0.477, p = 0.016) FEV1/FVC% (r = -0.640, p = 0.001) $MEF_{25-75\%}$ (r = -0.649, p = 0.001), and mean expiratory to inspiratory ratio of the mean lung density (E/I MLD) (r = 0.438, p =0.032).

Conclusions This is the first pCLE study to describe airway microscopic changes related to lung function and CT indices of small airways disease in COPD. These results suggest this novel imaging analysis technique may help uncover the earliest signs of airway remodelling in COPD offering new insights into key mechanisms of disease and potential novel endpoints for development of novel disease modifying treatments for this important disease.

S92 FENO NON-SUPPRESSION IDENTIFIES CORTICOSTEROID-RESISTANT TYPE-2 SIGNALING IN SEVERE ASTHMA

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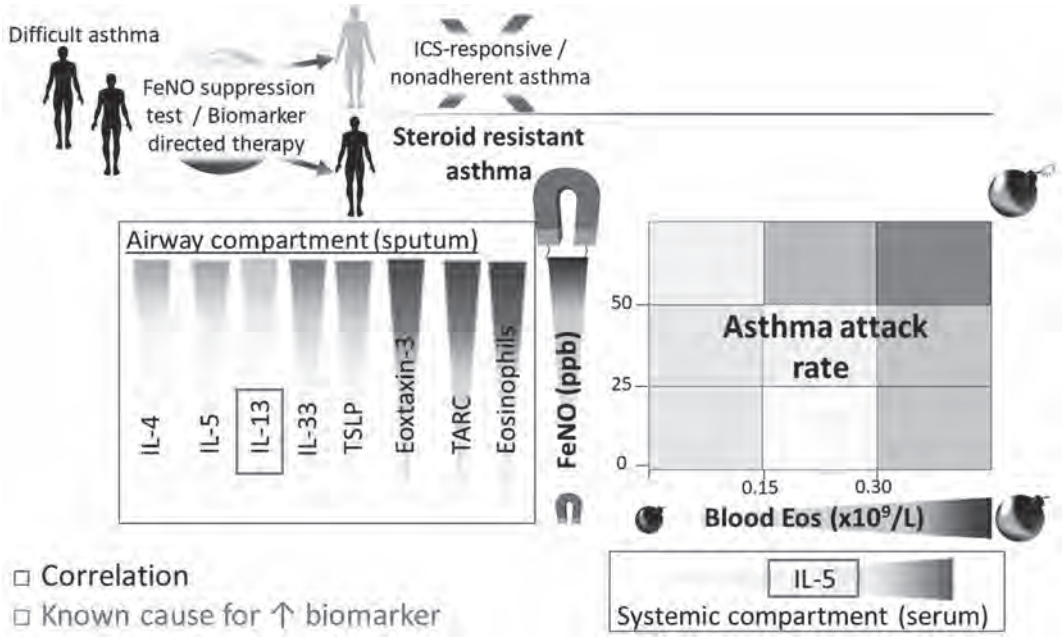
10.1136/thorax-2021-BTSabstracts.98

Rationale Patients with severe asthma, raised fractional exhaled nitric oxide (FeNO) and high blood eosinophil (Eos) counts are at increased risk of asthma attacks.



Abstract S92 Figure 1

Objective To investigate this relationship by correlating FeNO and blood Eos to inflammatory mediators in the airway and peripheral blood in severe asthma.

Methods Induced sputum Eos and 11 sputum supernatant plus 9 serum inflammatory proteins were analyzed by electrochemiluminescence or ELISA in a pooled cross-sectional analysis of patients with severe asthma and healthy controls. We recruited patients in whom we had a high degree of confidence in treatment adherence to high-dose inhaled corticosteroids (ICS) and/or systemic corticosteroids. Spearman correlations were computed between FeNO, blood Eos and sputum/serum analytes plus clinical measurements, controlling for a false discovery rate (FDR)<0.05. Significant correlations (*i.e.:* FDR<0.05) were translated in median-fold differences across biomarker categories (FeNO: <25, 25<50, ≥50 ppb; blood Eos: <0.15, 0.15-<0.30, ≥0.30×10^9/L) with Jonckheere-Terpstra tests used to assess the ordinal trends (p<0.05 significant).

Results Correlation of FeNO and sputum/serum analytes in 74 patients with severe asthma showed significant correlations with sputum Eos (r=0.51), interleukin (IL)-4 (r=0.48), IL-5 (r=0.47), IL-33 (r=0.35), thymic stromal lymphopoietin (TSLP: r=0.41), eotaxin-3 (CCL26: r=0.55), thymus associated regulated cytokine (TARC or CCL17: r=0.32), and asthma attacks in the previous year (r=0.25). Blood Eos correlated with serum IL-5 (r=0.41). In effect, FeNO non-suppression was associated with higher sputum Eos (fold-difference in median values, FeNO <25 to ≥50 ppb: 17-fold, p for trend =0.001), IL-4 (7.6-fold, p=0.0006), IL-5 (8.9-fold, p=0.006), IL-33 (1.8-fold, p=0.02), TSLP (5-fold, p=0.002), eotaxin-3 (10-fold, p=0.00003), TARC (3.5-fold, p=0.005), and asthma attacks in the past year (3-fold, p=0.03). Greater blood Eos (<0.15 to ≥0.3×10^9/L) was associated with higher serum IL-5 (1.9-fold, p=0.04). Results were similar when removing patients on systemic steroids. The highest FeNO and blood Eos categories generally had greater sputum Eos, sputum/serum type-2 cytokine, chemokine and alarmin levels than healthy controls.

Conclusion Raised FeNO despite adherence to high-dose ICS identifies corticosteroid-resistant airway type-2 cytokine (IL-4, -5), chemokine (eotaxin-3, TARC), alarmin (IL-33, TSLP) and sputum eosinophilia, while blood eosinophils correlate with systemic IL-5. These biomarkers provide complementary information on distinct immunological compartments.

Please refer to page A190 for declarations of interest related to this abstract.

S93 CORRELATION OF EOTAXIN-3 GENE EXPRESSION AND OTHER IL-13-INDUCED GENES IN PATIENTS WITH ASTHMA

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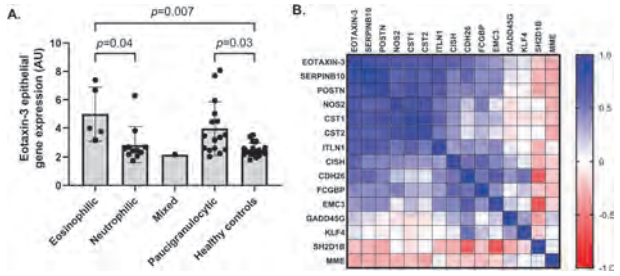
10.1136/thorax-2021-BTSabstracts.99

Background Eotaxin-3 is an eosinophilic chemokine. We investigated how its expression in the bronchial epithelium correlates with other IL-13 signature genes in asthma.

Methods We performed a *post-hoc* analysis of data in patients with asthma and healthy controls (PMID#28933920). Asthma inflammatory phenotype was determined by the induced sputum differential: eosinophilic >3%; neutrophilic >61%. Bronchial epithelial gene expression was measured using RNA microarrays on endobronchial brushes. Eotaxin-3 gene expression was compared between phenotypes by one-way ANOVA corrected for 10 comparisons. Pearson correlations (p<0.05 significant) were computed between eotaxin-3 and fourteen other IL-13-induced genes reported in *in vitro* epithelial cell studies.

Results Data from 38 asthmatics and 18 controls were included. Eotaxin-3 gene expression was highest in eosinophilic asthma (figure 1A). The correlation matrix (figure 1B) shows strong associations between eotaxin-3 gene expression and IL-13-induced-genes in patients with asthma. The 3 most correlated genes were Serpin Family B Member 10



Abstract S93 Figure 1

(SERPINB10: $r=0.85$), periostin (POSTN: $r=0.79$) and nitric oxide synthase 2 (NOS2: $r=0.72$). Correlations in controls were not significant (not shown).

Conclusion Eotaxin-3 gene expression is upregulated in the airway epithelium in eosinophilic asthma and highly correlates with IL-13 signature genes – including biomarker genes POSTN and NOS2.

Please refer to page A190 for declarations of interest related to this abstract.

From bench to lung: scientific advances in respiratory research

S94 ELITE ATHLETES SUSCEPTIBLE TO RESPIRATORY TRACT INFECTION ARE CHARACTERISED BY REDUCED CIRCULATING MEMORY T REGULATORY CELLS, UPPER AIRWAY MICROBIAL DYSBIOSIS AND DYSREGULATION OF SPHINGOLIPID METABOLISM

[1]L Cuthbertson, [2,3]SEG Turner, [4]A Jackson, [4]C Ranson, [4,5]M Loosemore, [2,3]P Kelleher, [1]WOC Cookson, [1]MF Moffatt, [1,2,4,5]JH Hull, [2,6]A Shah. *[1]National Heart and Lung Institute, Imperial College London, London, UK; [2]Department of Respiratory Medicine, Royal Brompton Hospital, Guy's and St. Thomas' NHS Foundation Trust, London, UK; [3]Department of Infectious Disease, Imperial College London, London, UK; [4]English Institute of Sport, UK; [5]The Institute of Sport Exercise and Health, University College Hospital London, London, UK; [6]MRC Centre of Global Infectious Disease Analysis, Department of Infectious Disease Epidemiology, School of Public Health, Imperial College London, UK*

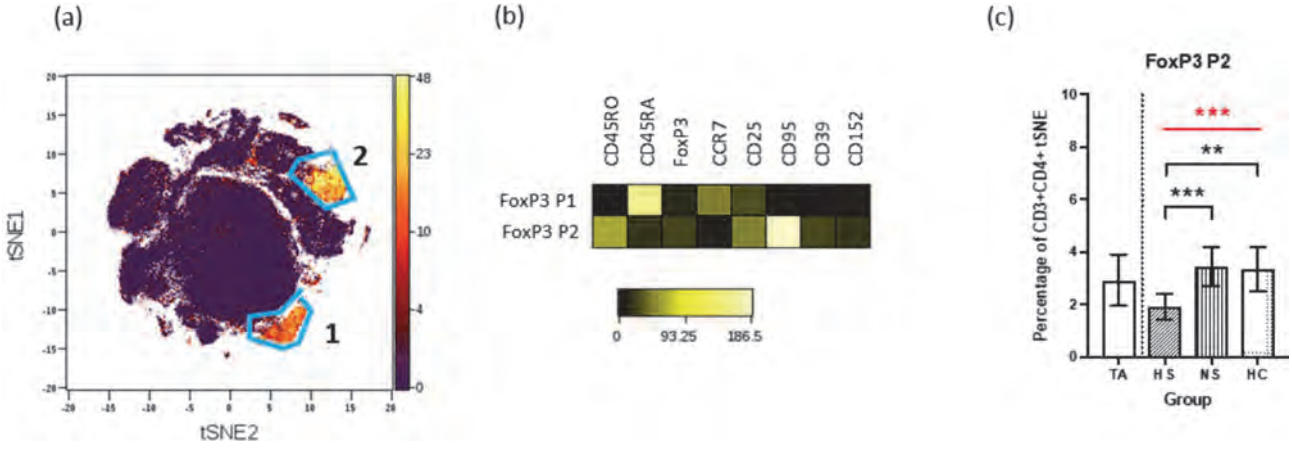
10.1136/thorax-2021-BTSabstracts.100

Rationale Respiratory tract infection (RTI) is a major issue in athlete health and is the leading cause of training and competition time-loss. The host-defence immunomodulatory factors associated with heightened RTI susceptibility remains unclear.

Objective This prospective study aimed to characterise host immune factors in international athletes exhibiting heightened RTI susceptibility. Methods/measurements: Comprehensive clinical and physiological phenotyping was prospectively undertaken in a cohort of 121 elite athletes. Athletes were characterised using objective retrospective electronic medical record analysis as highly susceptible (HS) (≥5 confirmed RTI over last 18 months) (N=22) or non-susceptible (NS) to RTI (<2 confirmed infections over last 18 months) (N=23). Peripheral blood lymphocyte population phenotyping of HS and NS athletes was performed by flow cytometry, with validation of findings by mass cytometry. The immune response to microbial stimuli was analysed by peripheral blood mononuclear cell (PBMC) stimulation assays. Further immuno-metabolic phenotyping was performed through 16S rRNA microbial sequencing of oropharyngeal swabs and global untargeted plasma metabolomic profiling. Findings were compared to data from a non-athletic healthy control group (N=10).

Main Results HS athletes had a persistently reduced memory T regulatory cell compartment compared to NS athletes (p=0.005) and healthy controls (p=0.002) (see figure 1) with a T helper 2 skewed PBMC immune response to microbial stimuli additionally seen in HS athletes. 16S rRNA microbial sequencing revealed a reduced bacterial biomass of the oropharyngeal microbiome in athletes compared to healthy controls (p=0.032), with plasma metabolomic profiling showing significant differences in sphingolipid pathway metabolites in HS athletes compared to NS athletes and healthy controls. Immune phenotypic differences were not related to sporting discipline or evidence of underlying asthma or atopy.

Conclusion Elite athletes have evidence of upper airway microbial dysbiosis, with a reduction in circulating memory T regulatory cells, and metabolic dysregulation of the sphingolipid pathway evident in those HS to RTI. Further prospective longitudinal work is needed to explore this novel



Abstract S94 Figure 1 CD4+ FoxP3 populations in elite athlete cohort. The $CD3^+$ $CD4^+$ T cell population identified using CyTOF was subjected to tSNE analysis using Cytobank. Using heat maps overlaid on tSNE plots, 2 FoxP3+ populations were identified and termed as FoxP3 P1 and FoxP3 P2 (a). Heatmaps were further used to examine differences in CD4 and Treg markers, with $FoxP3^+$ population 2 seen to be $CD45RO^{hi}CD45RA^{dim}CD95^{hi}$ identifying it as a memory Treg subset (b). FoxP3 P2 populations as a total of total CD3+CD4+ T cells were calculated (c) and compared for total athletes (TA), highly susceptible (HS), non-susceptible (NS) athletes and healthy controls (HC)

potential mechanistic link to elite athlete infection susceptibility.

Please refer to page A190 for declarations of interest related to this abstract.

S95 TRANSCRIPTIONAL SIGNATURES OF BLOOD OUTGROWTH ENDOTHELIAL CELLS FROM PATIENTS WITH PULMONARY ARTERIOVENOUS MALFORMATIONS AND HEREDITARY HAEMORRHAGIC TELANGIECTASIA

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10.1136/thorax-2021-BTSabstracts.101

Introduction and Objectives Pulmonary arteriovenous malformations (PAVMs) are most commonly caused by hereditary haemorrhagic telangiectasia (HHT). This multisystemic condition, inherited as an autosomal dominant trait, results from a heterozygous loss-of-function variant in *ACVRL1*, *ENG* or *SMAD4*. Heterozygous endothelial cell phenotypes have proved elusive, hindering preclinical testing of potential therapeutic agents. Here, our objective was to define the transcriptional changes occurring in patient-derived blood outgrowth endothelial cells (BOECs).

Methods With ethical approvals (16/ES/0095), BOECs were established from HHT/PAVM patients heterozygous for a pathogenic variant in *ACVRL1*, *ENG* or *SMAD4*, and from heathy volunteers. HHT gene protein production by patient and control BOECs was evaluated by ^{35}S-methionine pulse chase experiments. Single cell qRT-PCR aimed to verify expression and heterogeneity of 48 transcripts in 40 viable (DRAQ7 negative) BOECs per genotype. Long and short RNA libraries were generated from BOECs prior to Illumina HiSeq sequencing of paired-end reads, and alignment to GRCh38. Differential alignments were used to rank transcripts for discovery gene ontology process identifications.

Results 24 BOEC lines were established from patients heterozygous for one of 10 different nonsense (stop gain) pathogenic variants in *ENG*, *ACVRL1* and *SMAD4*, with a median of two donors per genotype. Pulse chase experiments distinguished the genotypes. Blinded analyses of normalised RNA-Seq alignments also identified the source heterozygous HHT genotypes: *ENG* alignments were lowest in heterozygous $ENG^{+/-}$ BOECs (Dunn's p=0.0089); *ACVRL1* alignments lowest in heterozygous $ACVRL1^{+/-}$ BOECs (p=0.0040) and *SMAD4* alignments lowest in heterozygous $SMAD4^{+/-}$ BOECs (p=0.007). By single cell qRT-PCR, 7/48 (15%) genes were expressed in all BOECs, 7/48 (15%) in no BOECs with 34 genes expressed in a proportion of BOECs. Seven genes displayed differential expression patterns between HHT and control BOECs, confirmed by distribution plots of all 16,807 RNASeq Ensembl transcript alignments in BOECs from different donors. Ranking transcripts by differential alignments in *ENG*/*ACVRL1*/*SMAD4* compared to control BOECs, identified consistent gene ontology processes enriched compared to equivalent numbers of randomly-selected transcripts.

Conclusions There are reproducible, transcriptional signatures in pulmonary AVM and HHT patient-derived BOECs distinguishable from healthy volunteer BOEC signatures. Common patterns for *ACVRL1*, *ENG* and *SMAD4* BOECs suggest a shared HHT transcriptome phenotype.

S96 PULMONARY ARTERIOVENOUS MALFORMATIONS – GENETIC VERSUS CLINICAL EVIDENCE OF UNDERLYING HEREDITARY HAEMORRHAGIC TELANGIECTASIA

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10.1136/thorax-2021-BTSabstracts.102

Introduction and Objectives Pulmonary arteriovenous malformations (PAVMs) result in early onset but preventable strokes and other complications. Patients know that PAVMs can be a familial condition, most commonly due to hereditary haemorrhagic telangiectasia (HHT). Since the April 2020 NHS National Genomic Test Directory launch, patients with PAVMs are eligible for gene testing only if they already meet a definite clinical diagnosis of HHT, requiring two further Curaçao Criteria from nosebleeds, mucocutaneous telangiectasia, or first-degree relative with HHT. Our goal was to test the validity of this requirement.

Methods We audited ClinVar-listed variants in the major HHT genes, and with ethical approval, case notes of patients with PAVMs who had undergone NHS genetic testing. Tests were ordered predominantly between 2015–2019 through Mainstreaming Genomics initiatives via gene-test panels, or whole genome sequencing through the 100,000 Genomes Project.

Results ClinVar lists 2,804 variants in *ENG, ACVRL1* and *SMAD4*, including 909 likely pathogenic/pathogenic variants that diagnose HHT. Most are loss-of-function frameshift, stop-gain and splice site variants (390/645 [60%] for *ENG*/*SMAD4*; 126/264 [47%] for *ACVRL1*). At least 50% of people with one of these variants would be expected to have PAVMs. At our institution, 124 patients with PAVMs were the first in their family to have a gene test. Of these, 83 (67%) tested positive for HHT, i.e. were found to be heterozygous for a likely pathogenic or pathogenic variant in *ENG, ACVRL1* or *SMAD4*. Focussing on the 83 patients with PAVMs and genetically-diagnosed HHT, only 63/83 (76%) met three or more Curaçao criteria. For the remaining 20 patients with PAVMs and a positive HHT gene test, none met the family history criterion for HHT. While 14 (70%) described nosebleeds as an adult, only 3 (15%) had classical HHT telangiectasia, and the cohort included families where pulmonary AVMs (single or multiple) were the only HHT clinical feature across individuals with *ENG* pathogenic variants in two generations.

Conclusions There is a high burden of deleterious variants in HHT genes. Two-thirds of unselected PAVM patients have genetically-confirmed HHT, but of these, 1 in 4 display few if any clinical features of HHT. Wider gene testing is recommended.

S97 INVESTIGATING THE PRO-FIBROTIC EFFECTS OF GALECTINS IN IPF – A POTENTIAL ROLE FOR GLYCAN-MEDIATED INTERACTIONS WITH INTEGRINS

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10.1136/thorax-2021-BTSabstracts.103

Introduction Integrins are a family of transmembrane heterodimer proteins differentially expressed on the cell surface of many lung cell types. Integrin-mediated activation of the key

pro-fibrotic mediator TGF-β1, plays a critical role in the pathogenesis of Idiopathic Pulmonary Fibrosis (IPF). Both galectin-1 and galectin-3 potentiate this TGF-β1 signaling pathway to promote fibrogenesis, although the exact mechanism is unclear. Integrins are glycoproteins thus their activity can be facilitated by glycan-mediated interactions with N-linked glycosylation the most well studied.[1]

Objective To investigate whether galectin-1 and galectin-3 interact directly with αvβ1, αvβ5 and αvβ6 integrins using biophysical methods.

Methods Integrin-galectin interactions were determined by surface plasmon resonance (SPR) in the presence of divalent cations and the effect of extensive integrin deglycosylation or removal of N-linked oligosaccharides alone explored. SPR was used to assess integrin-galectin interactions in the presence of small molecule galectin inhibitors, GB1107 (galectin-3 selective inhibitor) or GB1490 (galectin-1 selective inhibitor). Binding of both galectins to N-Acetyl-D-glucosamine was assessed by isothermal titration calorimetry (ITC).

Results SPR data showed that both galectin-1 and galectin-3 bind to recombinant human αvβ1, αvβ5 and αvβ6 in a glycosylation-dependent manner. Minimal integrin-galectin binding was observed following integrin protein deglycosylation or in the presence of small molecule galectin inhibitors which act via the galectin carbohydrate binding domain (CBD). However, the removal of integrin N-linked oligosaccharides alone resulted in only a partial decrease in integrin-galectin binding. Additionally, ITC demonstrated that both galectin-1 and galectin-3 were unable to bind N-Acetyl-D-glucosamine; the α5β1 terminal sugar required for α5β1-fibronectin binding.

Conclusion Galectins are able to bind to integrins via their post-translational glycosylation sites. Collectively, these data suggest that the presence of both N-linked and O-linked glycan residues are essential for integrin-galectin binding, and that this binding may occur at the galectin galactoside-binding pocket. Understanding the precise role of galectins in integrin-mediated TGF-β1 activation and IPF pathogenesis may be critical for the continued development of more effective and selective treatments for IPF patients.

REFERENCE

1. Janik ME, *et al*. Cell migration-the role of integrin glycosylation. *Biochim Biophys Acta*. **2010**;1800(6):545–55.

Please refer to page A190 for declarations of interest related to this abstract.

S98 DISSECTING HUMAN PLEURA AT SINGLE-CELL RESOLUTION

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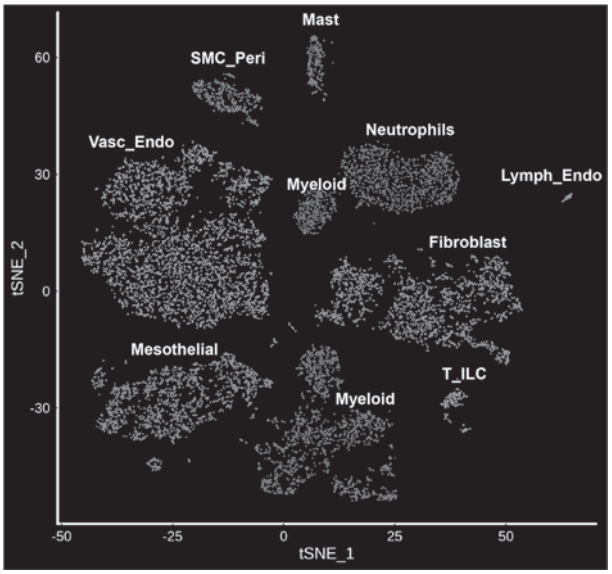
The mesothelium is a serous membrane lining of the coelomic cavities, which comprise the pleura, pericardium, peritoneum, tunica vaginalis testis and tunica serosa uteri. It is a dynamic structure important for tissue homeostasis by regulating inflammation and wound healing. Defects of the pleura are involved in the pathogenesis of pleural fibrosis and adhesions, and in malignant mesothelioma, an aggressive cancer associated with previous exposure to asbestos.



Abstract S98 Figure 1 Human parietal pleura scRNAseq of freshly prepared cells. T-distributed stochastic neighbour embedding (tSNE) of jointly analysed single-cell transcriptomes from 12,162 cells from 2 pneumothorax patients. Vasco_Endo, vascular endothelial cells; SMC_Peri, smooth muscle cells; T_ILC, T cells, innate lymphoid cells; B_pDCs, B cells, plasmacytoid dendritic cells; Lymph_Endo, lymphatic endothelial cells

Currently, there is an inadequate understanding of pleural biology in health, which impedes the development of treatments for these pleural pathologies. To address this, we aimed to establish a reproducible protocol for the isolation and culture of mesothelial cells from human pleural tissue. Moreover, using single-cell RNA profiling, we explored the cellular heterogeneity of human pleura in 8 patients treated for pneumothorax (figure 1). This resulted in the generation of a comprehensive atlas composed of mesothelial, stromal and immune cells, providing a valuable resource for further pleural research.

S99 FLUORESCENCE-LIFETIME IMAGING: A NOVEL DIAGNOSTIC TOOL FOR SUSPECTED LUNG CANCER

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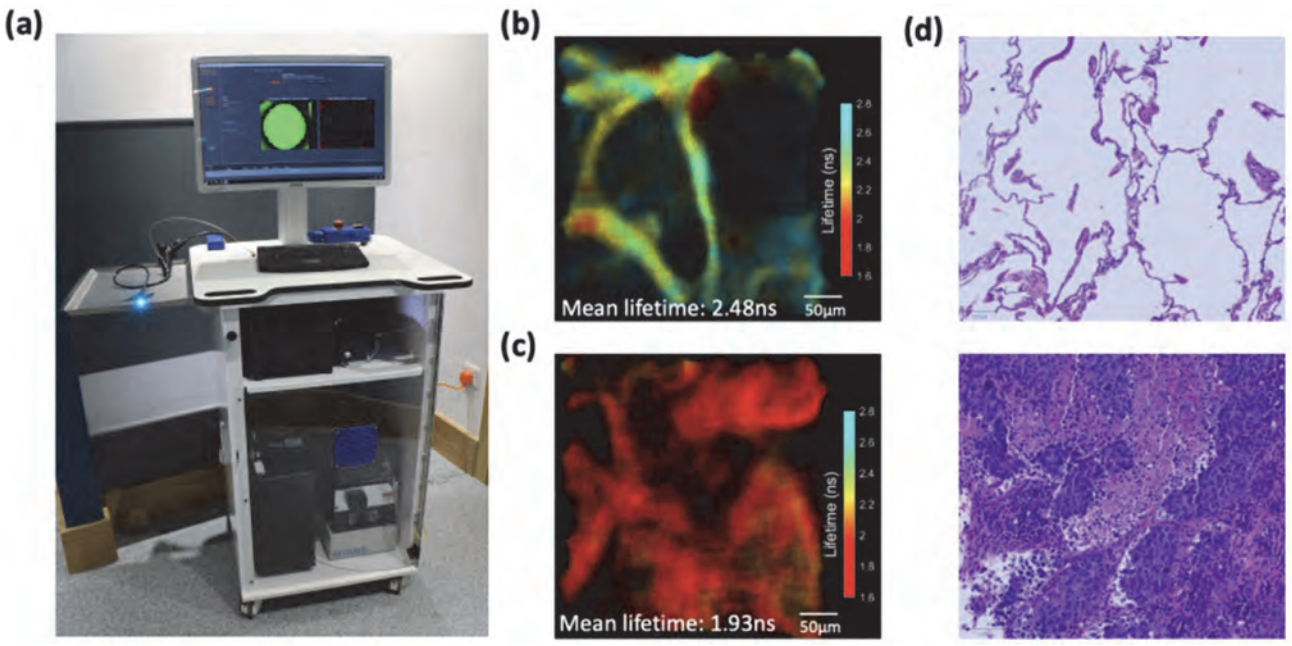
10.1136/thorax-2021-BTSabstracts.105

Introduction and Objectives Lung cancer is the commonest cause of cancer-related deaths. Early detection improves outcomes, however, the diagnostic yield of existing sampling techniques is suboptimal. Fluorescence-lifetime imaging microscopy (FLIM), an autofluorescence-based technique which measures endogenous fluorophore decay rates, may aid identification of optimal biopsy sites in suspected lung cancer. We describe the



Abstract S99 Figure 1 (a) Translational fibre-based FLIM system, with optical imaging fibre (1.42mm outer diameter) delivered via the working channel of a bronchoscope. Fluorescence lifetime images of (b) non-cancerous and (c) cancerous human lung tissue using fibre-based FLIM. (d) Corresponding haematoxylin and eosin stained sections of non-cancerous and cancerous (adenocarcinoma) lung tissue

application of a novel fibre-based FLIM system, which utilises 488nm excitation to enable fluorescence intensity and lifetime imaging, to detect changes in freshly resected lung cancer and adjacent healthy tissue. The mechanisms responsible for alterations in lung cancer fluorescence lifetime are not understood. We investigate the contributions of cancer cells and tumour stroma to fluorescence lifetime signatures using fixed unstained lung cancer and benchtop FLIM.

Methods Paired cancer and non-cancerous lung tissues were obtained from resection patients (n=21). A 488nm fibre-based FLIM platform was used to perform high-resolution fluorescence intensity and lifetime imaging (figure 1). Co-registered fixed unstained lung cancer sections were evaluated using benchtop FLIM and image analysis software.

Results Fluorescence lifetime is significantly reduced in fresh *ex vivo* lung cancer, compared with non-cancerous tissue (mean±SD, 2.15±0.26ns vs. 1.79±0.40ns, p<0.0001). Fibre-based FLIM distinguishes lung cancer, from adjacent tissue, with 81.0% sensitivity and 71.4% specificity. Lifetime-based signatures are retained after fixation, as evidenced by benchtop FLIM of fixed unstained lung cancer, which demonstrates no difference in fluorescence lifetimes compared with fresh cancer (p=0.55). By applying this technique on fixed tissues, we demonstrate that cancer cells have significantly longer lifetimes, compared with tumour stroma (p=0.027). Cancer subtype also influences lifetime signatures (mean±SD, adenocarcinoma 1.55±0.38ns vs. squamous cell carcinoma 2.57 ±0.47ns, p=0.0005). Mean fluorescence lifetimes of fixed unstained lung cancer positively correlate with the proportion of cancer cells within tissue section area (r=0.80; p=0.033).

Conclusions Our novel fibre-based FLIM system discriminates lung cancer from adjacent healthy tissue *ex vivo* with good performance characteristics. This minimally invasive technique, which is deliverable via endoscopic platforms, may permit advanced *in situ* diagnostic capabilities in lung cancer. FLIM of fixed unstained tissue enables cellular resolution lifetime characterisation, and highlights the role of cancer cells in determining the overall fluorescence lifetime signature in lung cancer.

Please refer to page A190 for declarations of interest related to this abstract.

Ease that wheeze: managing risk in COPD

S100 RISK OF CARDIOVASCULAR MORBIDITY AND MORTALITY IN PEOPLE WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE VERSUS THOSE WITHOUT COPD: A STRUCTURED REVIEW OF THE EVIDENCE

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10.1136/thorax-2021-BTSabstracts.106

Introduction and Objectives Comorbid chronic obstructive pulmonary disease (COPD) and cardiovascular disease (CVD) frequently occur together and are associated with worse outcomes for patients. This study provides a synthesis of recent evidence from observational studies determining the excess risk of CVD morbidity and mortality in patients with COPD, and the impact of COPD severity on risk.

Methods A structured review of the literature was conducted, using predefined search strategies, to search Medline and Embase (August 2020) for systematic reviews and meta-analyses (last 10 years) or observational studies (last 5 years) that reported risk of CVD (heart failure, hypertension, dysrhythmia, acute myocardial infarction [AMI], hypercholesterolaemia and stroke), diabetes and CV mortality in patients with COPD compared to those without. Risks are presented as reported in identified studies. Meta-analysis results are presented where available, otherwise an individual study range is reported.

Results A diagnosis of COPD was significantly associated with a two- to three-fold increased risk of CV mortality compared to people without COPD. Additionally, in patients with COPD there was a significantly increased incident risk of up to almost four-fold for hypertension (rate ratio [RR]: 0.95; 95% confidence interval 0.91–0.99 to 3.57; 3.41–3.74), up to six-fold for heart failure (RR: 1.46; 1.38–1.53 to 5.94; 5.50–6.42), up to five-fold for dysrhythmia (RR: 1.19; 0.98–1.43 to 4.74; 4.27–5.26), and up to two-fold for AMI (RR: 1.18; 0.81–1.71 to 1.89; 1.71–2.09). An increased risk was also observed for stroke (hazard ratio: 1.30; 1.18–1.43) and diabetes (risk ratio: 1.25; 1.16–1.34). No data on incident risk were identified for hypercholesterolaemia. A significantly increased risk in CV mortality compared to patients without COPD was demonstrated across all severity categories of mild, moderate and severe COPD; the risk increased further with increasing severity of COPD.
Conclusions There is substantive evidence for an association between COPD and the incidence of specific cardio- and cerebrovascular acute events or diseases. To minimise the risk of poor outcomes, it is important to ensure that patients with comorbid COPD and CVD are diagnosed early and optimally managed at all levels of health-care settings.

Please refer to page A190 for declarations of interest related to this abstract.

S101 METHODS FOR ASSESSING THE SUCCESS OR FAILURE OF COPD EXACERBATION TREATMENTS IN THERAPEUTIC CLINICAL TRIALS: A META-EPIDEMIOLOGICAL SYSTEMATIC REVIEW

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10.1136/thorax-2021-BTSabstracts.107

Introduction The overall outcome of a COPD exacerbation (treatment success or failure) is a critical outcome for clinical trials evaluating the management of COPD exacerbations. However, trials use heterogeneous definitions and instruments to evaluate this outcome, limiting the comparability of trial results. Here, we describe how often different measurement instruments are used to evaluate the overall outcome of COPD exacerbations, aiming to promote consistency.
Methods MEDLINE and the Cochrane Airways Trial Register were systemically searched. COPD exacerbation trials (2006–2020) reporting on treatment success or failure were included. Risk of bias was assessed. The definitions and measurement instruments used to assess treatment success/failure were collected and described narratively.
Results 56/176 (31.8%) of COPD exacerbation trials assessed the overall outcome of the exacerbation (treatment success or failure). 9/56 (16.1%) of studies had a low risk of methodological bias. Two categories of outcomes evaluating treatment success or failure were identified. Twenty-four RCTs used composite endpoints consisting of several undesirable outcomes to define treatment failure. The most frequently used components were death (59%), hospital admission (52%), treatment intensification (52%) or mechanical ventilation (37%). By comparison, thirty-three RCTs used qualitative descriptions of the status of the exacerbation (such as cure, improvement or failure), which were based on the patients' symptoms and signs (table 1). The overall outcome was evaluated at different timepoints, between 2 hours and 1 year from presentation.

Abstract S101 Table 1 Frequently used definitions of various COPD exacerbations states

Cure or Resolution	Number of Studies (n = 56)
Complete resolution of all signs and symptoms of the exacerbation.	10
Sufficient improvement of the signs and symptoms such that no additional systemic treatments were prescribed.	5
Improvement	
Improved signs and symptoms, without any new signs or symptoms.	8
Improved symptoms as evaluated by clinical scores.	6
Treatment failure	
Lack of resolution of signs and symptoms, requiring additional treatment, or death.	7
Persistence or worsening of signs and symptoms, or death.	7
Lack of resolution of signs and symptoms, or need for further treatment.	4

Conclusions There is significant heterogeneity in the instruments used to evaluate treatment success or failure in COPD exacerbation trials. Standardization could promote comparability.

S102 THE UNDER RECOGNISED ROLE OF MODERATE EOSINOPHILIA ON EXACERBATION FREQUENCY IN COPD PATIENTS: A SINGLE CENTRE STUDY

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10.1136/thorax-2021-BTSabstracts.108

Introduction and Objectives High eosinophil levels in patients with COPD are a well established risk factor for frequent exacerbations. Our study aimed to determine whether more moderate eosinophil levels are also a significant driver of frequent exacerbations.
Methods We retrospectively identified 213 patients who presented with a severe exacerbation of COPD to our unit from 01 January 2018 to 31 December 2018. Patients were divided into three groups: high eosinophilia (peak eosinophil level $\geq$0.5); moderate eosinophilia (peak eosinophil level 0.3–0.4) and low eosinophilia (peak eosinophil level $\leq$0.2).

The exacerbation frequency and trajectory of patients was followed up for 18 months. Standard univariate statistical analysis was undertaken to determine the impact high, moderate, and low eosinophilia had on exacerbation frequency.
Results For patients who were initially infrequent exacerbators, moderate eosinophilia was associated with a shift towards increased exacerbation frequency ($p<0.05$). High eosinophilia however was not associated with increased exacerbation frequency ($p=0.897$).

For patients who were initially frequent exacerbators, moderate eosinophilia was associated with a sustained high exacerbation frequency ($p<0.05$). High eosinophilia however was not associated with a sustained high exacerbation frequency ($p=0.2178$).

Of those patients with high eosinophilia (n=65), 42.19% were on a high inhaled corticosteroid dose compared to 8.70% of those with moderate eosinophilia (n=70), ($p<0.0001$).

Conclusion Our study shows that moderately raised eosinophils in COPD are associated with significantly increased long term exacerbation frequency trends.

Our data suggests that in clinical practice high eosinophil levels in COPD patients are more readily identified by clinicians, leading to escalation in ICS therapies to successfully manage exacerbation frequencies. The significance of moderate eosinophil levels is likely under recognised and these patients may also benefit from escalation in ICS therapies.

S103 THE PROVISION OF THE FIVE FUNDAMENTALS OF COPD CARE – FINDINGS FROM A UK-WIDE SURVEY OF PEOPLE WITH COPD

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10.1136/thorax-2021-BTSabstracts.109

Introduction and Aims Patient-reported data on care provided for people with chronic obstructive pulmonary disease (COPD) is patchy. This research aims to understand what care is being provided to this population, and how it affects people. This data will provide the basis of recommendations for service improvements.

Methods Between December 2020 – May 2021, the Asthma UK and British Lung Foundation ran an online survey of people with COPD. The survey received 8,232 responses. Using NICE's *Five fundamentals of COPD care,*[1] respondents were asked about the care they received for their condition, as well as their experiences of living with the condition. Respondents were judged to have received the five fundamentals of care if they gave a positive answer to the elements they were eligible for (based on their MRC breathlessness score and smoking status).

Results 24.5% of all respondents received all of the measures of care they were entitled to. Considerable variation lies behind this overall figure, with rates of provision ranging from 28.5% in South West England, to 13.5% in Northern Ireland. 13.3% of respondents who told us they had more than 10 exacerbations in the past 12 months received these care measures, compared to 28.5% of people who between zero and two exacerbations in the past year. Those who have lived with COPD for over ten years were more likely (36.0% received care measures) to receive these care measures than those who have been diagnosed in the past two years (10.6%).

Conclusions This research indicates a significant proportion of people with COPD are not receiving the five fundamentals of COPD care. There is also considerable variation in provision among the COPD population, and improving care provision needs to be made a priority in order to improve clinical outcomes and reduce exacerbations.

REFERENCE

1. National Institute of Health and Care Excellence (NICE), 2018. *Chronic obstructive pulmonary disease in over 16s: non-pharmacological management and use of inhaled therapies.* Accessed at https://www.nice.org.uk/guidance/ng115/documents/supporting-documentation

S104 COST-EFFECTIVENESS OF TRIPLE THERAPY WITH BUDESONIDE/GLYCOPYRRONIUM/FORMOTEROL FUMARATE VERSUS DUAL THERAPIES IN MODERATE-TO-VERY SEVERE COPD IN THE UNITED KINGDOM: ANALYSIS BASED ON THE KRONOS STUDY

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10.1136/thorax-2021-BTSabstracts.110

Introduction The 24-week KRONOS study (NCT02497001) showed that fixed-dose triple therapy with budesonide/glycopyrronium/formoterol fumarate 320/14.4/10 μg (BGF 320) metered dose inhaler (MDI) was more efficacious at improving lung function than fixed-dose long-acting muscarinic antagonist (LAMA)/long-acting β_2-agonist (LABA) and inhaled corticosteroid (ICS)/LABA dual therapy in symptomatic patients with moderate-to-very severe chronic obstructive pulmonary disease (COPD). In KRONOS, >70% of patients had no moderate or severe exacerbations in the previous year. Here, using KRONOS data, the lifetime cost-effectiveness of BGF 320 versus LAMA/LABA and ICS/LABA dual therapies in the United Kingdom is estimated.

Methods A Markov model was used to extrapolate incurred costs and quality-adjusted life-years (QALYs) for patients with moderate-to-very severe COPD. The model accounted for progression in severity (lung function decline), occurrence of moderate and severe exacerbations, adverse events, and discontinuations from the KRONOS study for BGF MDI 320, the LAMA/LABA glycopyrronium/formoterol fumarate 14.4/10 μg (GFF) MDI and the ICS/LABA budesonide/formoterol fumarate 400/12 μg (BUD/FORM) dry powder inhaler. Health care resource utilization was based on KRONOS data; unit costs came from UK National Health Service reference costs, the Personal Social Services Research Unit manual and the published literature. EuroQoL 5-dimension 5-level utilities for COPD severity states were estimated from KRONOS; exacerbation disutilities were sourced from a systematic literature review. A lifetime horizon was considered. Costs and QALYs were discounted at 3.5% per annum.

Results For BGF 320 versus GFF and BUD/FORM, respectively, incremental costs were £1500 and £2598, incremental QALYs were 0.49 and 0.38 and incremental exacerbation reductions were –4.29 and –1.78. The incremental cost-utility ratios (ICUR) for BGF 320 were £3082 and £6868 per QALY gained versus GFF and BUD/FORM, respectively.

Discussion Based on KRONOS data, triple therapy with BGF 320 was cost-effective versus LAMA/LABA and ICS/LABA dual therapies at the conventional UK-adopted willingness to pay (ICUR < £20000 per QALY) in a moderate-to-very severe COPD population where >70% of patients had no moderate or severe exacerbations in the prior year. The main cost-effectiveness driver for BGF 320 triple therapy versus dual therapies was the reduction in exacerbation rate, which reduced costs and preserved quality of life.

Please refer to page A190 for declarations of interest related to this abstract.

ILD: how big is the problem? How can you spot it and how should you monitor it?

P1 GLOBAL OVERVIEW OF INCIDENCE AND PREVALENCE OF INTERSTITIAL LUNG DISEASE: A SYSTEMATIC LITERATURE REVIEW

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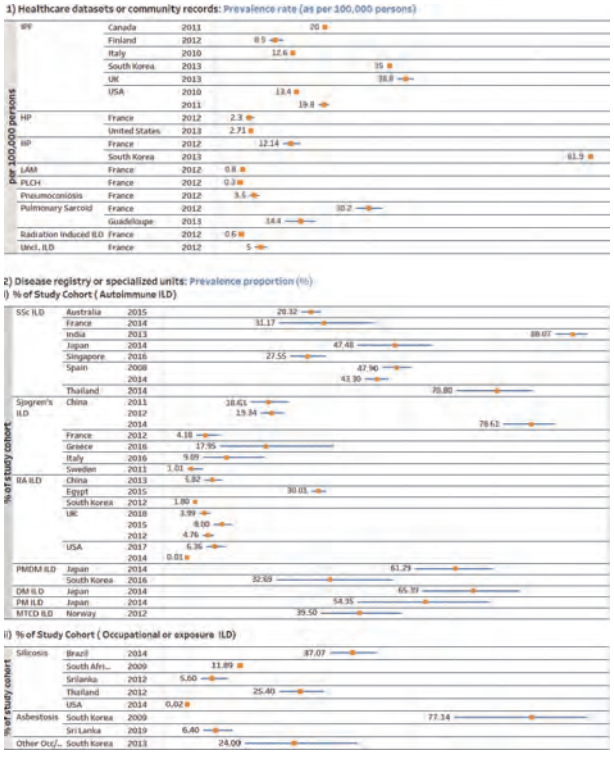
10.1136/thorax-2021-BTSabstracts.111

Introduction Interstitial lung diseases (ILD) are a diverse group of pulmonary fibrotic and inflammatory conditions. The global burden of ILD is largely unknown, in part because of differences between countries in diagnosis and in coding practices[1]. Reviews to date have therefore tended to be limited in geographical scope and focused on individual ILDs. Our aim was to systematically review evidence for ILD prevalence and incidence on a global scale.

Methods A systematic search of Medline and Embase was conducted to identify relevant articles reporting the incidence and/or prevalence of individual ILD subtypes. The search was limited to observational studies published between 2015 and 2020 in English, with articles independently screened by two reviewers. An adapted Newcastle-Ottawa scale was used to assess quality and risk of bias.

Results Of 8,560 articles, 51 studies were included. Geographically, most studies were from Asia (47.1%) and Europe (43.1%). Significant heterogeneity was noted in the incidence and prevalence (figure 1) of ILDs between different countries. These variations are largely attributed to the diversity of the underlying population and differences in data sources used. For example, the prevalence of systemic sclerosis ILD ranged from 30% in Europe to 71% in Asia, silicosis ranged from 0.02% in the USA to 37% in Brazil. IPF was the most reported ILD, the range of prevalence was 8.5 to 38.8 per 100,000 persons, and incidence was 2.4 to 48.5 per 100,000 persons-years, across regions.

Discussion There have been few reviews investigating the epidemiology of ILDs overall or by subtypes. ILD publications differed by region, for example, more studies from Asia explored occupational ILDs, whereas more European studies reported on autoimmune ILDs. With an increasing research interest in progressive fibrosing ILDs, there is a need to understand the global burden of ILD and highlight unmet needs.



Abstract P1 Figure 1 Prevalence stratified by underlying population and reporting units
IIP, idiopathic interstitial pneumonia; IPF, idiopathic pulmonary fibrosis; NSIP, nonspecific interstitial idiopathic pneumonia; DIP, desquamative interstitial pneumonia; OP, organizing pneumonia; RA-ILD, rheumatoid arthritis ILD SSc-ILD, systemic sclerosis ILD; PM/ DM ILD, polymyositis/ dermatomyositis; MTCD, mixed connective tissue ILD; HP, hypersensitivity pneumonitis ILD; LAM, lymphangioleiomyomatosis; PLCH, pulmonary Langerhans cell histiocytosis

REFERENCE

1. King TE. *Am J Respir Crit Care Med*. 2005;**172**:268–279.

P2 GEOGRAPHICAL VARIATION OF INTERSTITIAL LUNG DISEASE IN THE NORTHERN TRUST

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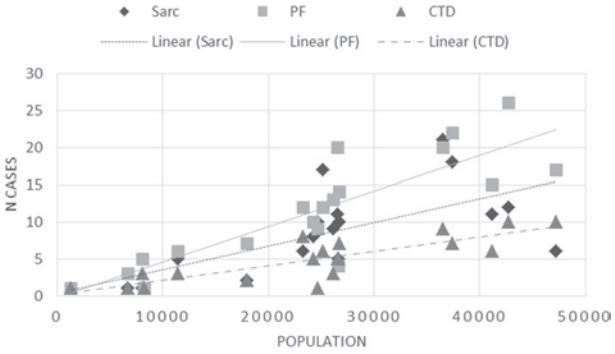
10.1136/thorax-2021-BTSabstracts.112

Aims There are geographical variations in Interstitial Lung disease, particularly sarcoidosis, that may shed light on aetiology and aid service development. The Northern Trust services a population of all most 471'000 people across a geographic area of 1,733 square miles making it the largest geographical trust in Northern Ireland. By exploring this unique attribute, we sought to define the geographical prevalence of Interstitial Lung Disease (ILD) and investigated whether this was affected by population density. Secondary aims included quality improvement in service provision.

Methods We identified 712 patients attending the ILD clinic within the last 12 months. Patients were classified on the basis of CT imaging and electronic care record review. Baseline demographic data and geographic location (Postcode) were collated and compared to recent census data to define population density and crude rates of prevalence. Average travel distance for patients attending clinic twice a year were calculated and compared to a proposed satellite clinic closer to patient homes.

Results Of the 712 patients included in analysis; 171 (24%) Sarcoidosis, 157 (22.1%) definite or probable UIP, 67 (9.4%)



Abstract P2 Figure 1

unclassified Pulmonary Fibrosis, 67 (6.5%) Fibrotic Hypersensitivity Pneumonitis, 100 (14%) CT-ILD and 71 (9.9%) exposure including Asbestos were classified. Crude prevalence rates (per 100'000 (Min-Max)) for Sarcoidosis 31.4 (11.1–67.5), UIP definite and probable 47.5 (12.2–76.9) and CT-ILD 23.1 (12.2–76.9). Prevalence of disease appeared to correlate with population density (figure 1) however there was a suggestion of clustering associated with topographic features particularly with regards to sarcoidosis.

Exploratory analysis of patient travel distance suggested that reallocation of 108 patients (15%) to a satellite clinic closer to home could save in excess 14'000 miles per year, reducing the carbon footprint by 4.15 tonnes.

Conclusions Northern Ireland has a stable population with little drift making it ideal for study. Preliminary analysis of data suggests intriguing clusters which may lead to insights into disease pathogenesis with further study. Analysis of crude prevalence and patient travel distance allows for planning of service provision and a potential reduction of carbon footprint.

P3 PROGRESSION OF EARLY FIBROTIC ILA TO ESTABLISHED INTERSTITIAL LUNG DISEASE AND MORTALITY: OBSERVATIONS FROM A REGIONAL CENTRE

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10.1136/thorax-2021-BTSabstracts.113

Introduction Interstitial lung abnormalities (ILA) are defined as patterns of increased lung density on CT scans, compatible with early interstitial lung disease (ILD). Patients are typically asymptomatic, but a proportion will progress to pulmonary fibrosis. Factors predisposing to this are unclear.

Aims Determine estimated prevalence of fibrotic ILAs in specified geographical region (Oxfordshire), and explore factors contributing to progression and mortality.

Methods Using the Clinical Record Interactive System database of the Oxford University Hospitals NHS trust (serving an estimated population of 800,000), we analysed reports from CTs performed between January-2015 and December-2020. Search criteria were selective for early fibrotic ILA within this database; ['reticulation' or 'interstitial'] AND ['sub-pleural' or 'basal' or 'lower zone' or 'Possible UIP'] AND [Age: 45–75]. Radiological features, patient demographics and contemporaneous blood leukocyte counts were examined to explore contribution to progression and mortality using multivariate Cox regression.

Results 40,711 patients underwent CT thorax during this period; 2735 (6.7%) patients met inclusion criteria. Mean age 65.5 years (±7.32), male 1486 (54.3%). 762 of these patients had traction bronchiectasis and/or honeycombing on first CT. 355 cases had normal CTs; 80 had non-emphysematous cysts and GGO only in 279. The remaining 1259 cases demonstrated reticulation ±additional parenchymal features (Table 1).

Follow on CT was performed in 390 cases. Progression was observed in 47.4%; progression to reticulation 28 (7.1% of 390), of reticulation 51 (13.1%), to probable UIP 84 (21.2%), to definite UIP 22 (5.6%).

Compared to the group with normal CT, reticulation combined with emphysema ±GGO demonstrated significant risk of mortality (Table1). Of those that underwent follow-on CT, progression appeared significantly associated with mortality [HR 1.92, 1.2–3.2, p=0.013]. Progression to definite UIP was associated with greatest mortality risk [HR 3.47, 1.6–7.5, p=0.002]. Monocyte:lymphocyte ratio [1.50, 1.16–1.94, p=0.002] and age [1.04, 1.01–1.07, p=0.010] at first CT scan, were the only independent factors associated with progression.

Conclusion 3.1% (1259/40,711) of patients requiring thoracic CT during our analysis period demonstrated ILA with early fibrotic features. Monocyte:lymphocyte ratio was significantly associated with progression suggesting this and other blood leukocyte derivations could be explored further as potential prognostic biomarkers of sub-clinical ILD.

P4 LUNG CANCER SCREENING PROVIDES A UNIQUE OPPORTUNITY FOR EARLY DIAGNOSIS AND MANAGEMENT OF INTERSTITIAL LUNG DISEASES

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10.1136/thorax-2021-BTSabstracts.114

Abstract P3 Table 1 Univariate and multivariate cox regression analysis for outcome of mortality. Hazard ratios of ILD categories are expressed relative to Nil ILD group

Table 1. Outcome = Mortality			Univariate				Multivariate			
Covariate	**n**	**Death**	**HR**	Lower	**Upper**	**Sig.**	**HR**	**Lower**	**Upper**	**Sig.**
Age	–	–	1.02	1.01	1.04	0.0001*	1.02	1.01	1.04	0.002*
Gender	–	–	1.14	0.95	1.37	0.140	1.08	0.89	1.31	0.420
Nil ILD (ref. category)	355 (13.0%)	43 (12.1%)	–	–	–	<0.001*	–	–	–	<0.001*
GGO only	279 (10.2%)	54 (19.3%)	1.67	1.12	2.50	0.011*	1.63	1.09	2.43	0.017*
Reticulation only	603 (22.0%)	68 (11.3%)	1.09	0.74	1.59	0.667	1.01	0.69	1.48	0.966
Reticulation + GGO	373 (13.6%)	55 (14.7%)	1.43	0.96	2.13	0.079	1.39	0.93	2.07	0.108
Reticulation + Emph	133 (4.9%)	28 (2.1%)	2.32	1.45	3.71	<0.001*	2.08	1.29	3.35	0.003*
Retic + GGO + Emph	150 (5.5%)	27 (18.0%)	1.74	1.07	2.81	0.025*	1.67	1.03	2.70	0.038*
Probable UIP	490 (17.9%)	86 (17.5%)	1.58	1.10	2.28	0.014*	1.45	1.01	2.11	0.047*
Definite UIP	272 (9.9%)	87 (32.0%)	2.82	1.95	4.10	<0.001*	2.55	1.76	3.69	<0.001*

* P<0.05. GGO; ground glass opacities, UIP; Usual interstitial pneumonia, Emph; Emphysema.

Background Early detection and treatment of lung cancer through low- dose computed tomography (LDCT) screening reduces lung cancer mortality. Undiagnosed interstitial lung disease (ILD) can be incidentally detected on LDCT, but whether this leads to improved clinical outcomes is unclear.
Methods The West London lung screening pilot invited ever-smokers aged 55–75 for a lung health check, and LDCT for those meeting a prespecified lung cancer risk score. LDCTs were reported by 5 consultant thoracic radiologists with $\geq$ 8 years thoracic CT experience. Participants without known ILD and with (i) >10% interstitial lung abnormalities (ILAs) as defined by the Fleischner Society on LDCT (ii) 5–10% ILAs on LDCT and restrictive spirometry (pre-March 2020), (iii) ILAs >5% (without spirometry post-March 2020), (iv) progressive ILAs on serial imaging performed after 12–24 months, were referred for clinical evaluation to the ILD Unit at the Royal Brompton Hospital. Diagnoses were assigned after multidisciplinary team (MDT) discussion.
Results ILAs of >5% extent on LDCT were identified in 39/1853 (2.1%) subjects screened between August 2018 and April 2021 (table 1). Respiratory symptoms were present in 18/39 (46.1%) and crackles were auscultated in 17 of 22 subjects (77.3%) undergoing physical examination. Past exposure to potential environmental triggers was noted in 21/39 (53.8%). Diagnostic bronchoalveolar lavage was performed in 7/39 (17.9%) and one patient underwent transbronchial lung cryobiopsy. After MDT discussion, ILD was concluded in 31/39 (79.5%) cases, of which 14/31 (45.2%) were diagnosed with IPF. In the IPF subgroup, antifibrotics were initiated in 7/14 (50%) of cases. In those diagnosed with other ILDs, immunomodulatory treatment was initiated in 2/25 (8%) subjects.
Conclusion A large proportion of individuals with newly identified ILAs have an abnormal clinical examination and respiratory symptoms, consistent with the widely held suspicion that ILD is underdiagnosed in the community. Lung cancer screening in this demographic provides a unique opportunity to address this unmet health metric. Earlier identification of ILD, specifically IPF, allows institution of antifibrotic therapies proven to modify the natural history of the disease by preserving lung function and extending life. The cost-effectiveness of this approach for ILD screening warrants detailed evaluation.

Abstract P4 Table 1 Characteristics of the subjects

Characteristics		Subjects with ILAs on LDCT (*n = 39*)
Age, yr, mean (± SD)		68.8 (± 4.3)
Gender, n (%)	Female	15 (38.5)
	Male	24 (61.5)
Smoking status, n (%)	Current	7 (17.9)
	Ex	32 (82.1)
Respiratory symptoms, n (%)	None	19 (48.7)
	Cough	3 (7.7)
	Dyspnoea	9 (23.1)
	Cough & dyspnoea	6 (15.4)
	N/A	2 (5.1)
Physical examination findings, n (%)	None	5 (12.8)
	Crackles	17 (43.6)
	N/A	17 (43.6)
Baseline lung function,%pred, median (range)	FEV1,% pred	91 (58 – 130)
	FVC,% pred	94.8 (65 – 143)
	TLco,% pred	57.6 (28.4 – 98.8)
	Kco,% pred	79.5 (36.4 – 94)
MDT Diagnosis		
ILAs, n (%)		8 (20.5)
ILD, n (%)	IPF	14 (35.9)
	Smoking-related ILD	6 (15.4)
	Hypersensitivity pneumonitis	4 (10.3)
	PPFE	3 (7.7)
	Sarcoidosis	1 (2.6)
	Post-COVID ILD	1 (2.6)
	Vasculitis	1 (2.6)
	Unclassifiable	1 (2.6)
Treatment, n (%)	Smoking cessation advice	6 (15.4)
	Antifibrotic	7 (17.9)
	Immunomodulatory treatment	2 (5.1)
	None	23 (59)

P5 HOW SHOULD PATIENTS WITH INTERSTITIAL LUNG ABNORMALITIES BE EVALUATED AND MONITORED? EXPERIENCE FROM A SECONDARY CARE INTERSTITIAL LUNG DISEASE CLINIC

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10.1136/thorax-2021-BTSabstracts.115

Introduction Interstitial lung abnormalities (ILA) have been defined as incidental radiological parenchymal abnormalities without clinical suspicion of interstitial lung disease (ILD)[1]. It is recognised that they are clinically important due to increased risk of pulmonary fibrosis, exercise impairments and mortality. A recently published Fleischner Society position paper described three subcategories of ILA[1]; non-subpleural, subpleural non-fibrotic and subpleural fibrotic. Little is known about the real world management of these patients.
Methods We performed a retrospective analysis of an ILD database containing 1298 patients covering a population of 820,000.
Results 55 patients with ILA were identified (61.8% male, median age 75 (IQR 69.5–79), current or ex-smokers 70.9%). 33/55(60%) were categorized as subpleural fibrotic, 15/55 (27.2%) as subpleural non-fibrotic and 7/55(12.7%) as non-subpleural. Baseline pulmonary function showed a mean (S.D.) FVC% predicted of 98.76% (±19.94) and TLCO% predicted of 59.45%(±23.45).

42/55(76.3%) patients were followed up and 13/55(23.7%) were discharged with safety netting after initial consultation. A further 26 were discharged after a period of follow up (mean (S.D) 18.5(26.3) months). 16/55(29.1%) remain under active follow up, mean duration 22.3 months. 1 patient was re-referred after discharge.

11 (20%) patients died within 3 years of ILA identification. In those who died, there was no significant difference in age, co-morbidities or baseline pulmonary function compared to survivors. Cause of death was known in 7/11, one caused by lung cancer, none by ILD. 6/42(14.3%) reported worsening respiratory symptoms during the follow-up period. 27/42 patients had serial pulmonary function available at 12 months, of which 3(11.1%) had >10% decline in FVC. 23 had repeat

CT imaging within 3 years of which 7 (30.4%) showed radiological progression. 1 patient progressed to ILD.

Conclusions The majority of patients had subpleural fibrotic ILA. Based on our findings that a significant number of patients had evidence of disease progression over follow-up period, we recommend that patients with ILA should be monitored annually with serial pulmonary function with clinical review if symptomatically deteriorating.

REFERENCE

1. Hatabu H, *et al*. Interstitial lung abnormalities detected incidentally on CT: *a position paper from the fleischner society. LancetRespi Med* 2020;**8**:726–737.

P6 TELEHEALTH FOR PATIENTS WITH INTERSTITIAL LUNG DISEASES (ILD): RESULTS OF AN INTERNATIONAL SURVEY OF CLINICIANS

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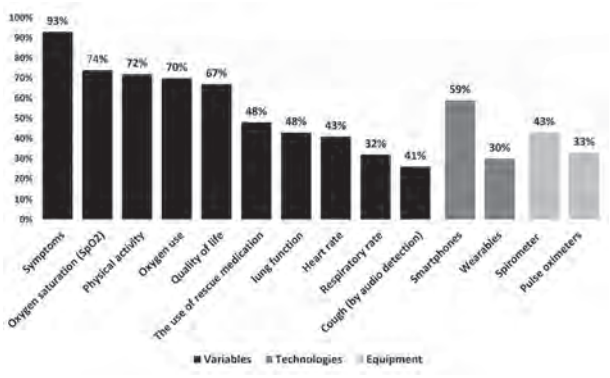
10.1136/thorax-2021-BTSabstracts.116

Introduction Clinicians and policy makers are promoting widespread use of home technology and spirometry to detect disease progression for patients with ILD; the COVID-19 pandemic has accelerated this. Data on the potential utility of telehealth in ILD is limited.

Aim This survey investigated clinicians' opinions about methods and practices used to monitor disease progression in patients with ILD using telehealth.

Methods Clinicians were invited to participate in a cross-sectional survey (SurveyMonkeyTM) of 13 questions designed by an expert panel. Telehealth is defined as home monitoring of symptoms and physiological parameters with regular automatic transmission of data from the patient's home to the clinicians. Data are presented as percentages of respondents.

Results A total of 207 clinicians from 23 countries participated in the survey. A minority (81, 39%) reported using telehealth, but of those using telehealth, a total of 41 answered the question asking if telehealth was effective. The majority (n= 32, 78%) believed it to be quite or more effective. Higher telehealth use was observed in Europe (n=94, 45%) than Asia (n=51, 25%) and America (24%). Clinicians reported the most useful telehealth monitoring technologies were smartphone app (59%) and wearable sensors (30%). Telehealth was most frequently used for monitoring disease progression (70%), quality of life (63%), medication use (63%) and reducing the need for in-person visits (63%). Clinicians reported most often monitoring symptoms (93%), oxygen saturation (74%) and physical activity (72%) (Figure 1). The equipment perceived most effective were spirometer (43%) and pulse oximeters (33%). The primary barriers to clinicians' participation in telehealth were technical (47%), training (45%), and organisational structure (43%). Clinicians considered that patients' barriers to participation might include lack of awareness (60%), lack of knowledge using smartphones (49%), and lack of confidence in telehealth (44%).



Abstract P6 Figure 1 Clinicians' opinions about methods and practices that are being used to monitor disease progression in patients with ILD using tele-health

Conclusion A minority of ILD clinicians completing this survey used telehealth to monitor patients, but of those who did, there was some support for clinical utility. Our findings emphasise the need for robust research in telehealth as a mode for the delivery of healthcare services for ILD and highlight the need to assess patients' perspectives to improve telehealth experiences in ILD patients.

P7 REMOTE FRAILTY ASSESSMENT AND PREVALENCE OF FRAILTY IN OLDER OUTPATIENTS WITH IDIOPATHIC PULMONARY FIBROSIS

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10.1136/thorax-2021-BTSabstracts.117

Introduction Idiopathic Pulmonary Fibrosis (IPF) patients are older with impaired physiology, and therefore at risk of frailty syndromes including falls, immobility, and toxicity from polypharmacy. Frailty correlates with quality of life, hospital admissions, and mortality.[1] IPF outpatients would benefit from their clinicians receiving training in frailty identification, to facilitate early referral to frailty services and targeted interventions to reduce admissions and mortality.

Objectives

1. Can respiratory clinicians identify frailty remotely in outpatients with IPF from the electronic patient record (EPR)?
2. What is the prevalence of frailty in older IPF patients in one ILD clinic?

Methods We identified older outpatients with IPF from one clinic, who were alive and aged >65 years in May 2021. Clinicians were trained by a consultant geriatrician to determine the Clinical Frailty Scale (CFS) score retrospectively for IPF patients remotely from the EPR using a validated method.[2] Demographic, physiologic and lung function data were also collected from EPR. GP summary care records were reviewed for frailty coding to supplement hospital records.

Results See table 1. 11/29 patients were vulnerable (CFS=4). A further 18/29 patients were mild or moderately frail (CFS 5–6). None expressed features of advanced frailty (CFS =7). Another surrogate marker of frailty, weight loss $\geq$ 5% was evident in 14/29 (average weight loss 5kg (7%) between diagnosis and latest clinic follow up).

Conclusions Respiratory clinicians could determine CFS in all identified IPF outpatients using the EPR. We plan to validate these data with face to face frailty assessments performed by the frailty service when available. We had insufficient data to correlate frailty score with IPF severity. Our findings provide a basis for inter-disciplinary frailty training and education

Abstract P7 Table 1 Patient Characteristics and Prevalence of Frailty

			All (n=29) n (%)	Min	Max
Mean Age *(years)*			80	66	92
Males			22 (76)		
Ethnicity	Caucasian		22 (76)		
	Asian		3 (10)		
	Afro-Caribbean		2 (7)		
	Other		2 (7)		
Body Mass Index (kg/m2) *mean.*			25	17	36
FVC% predicted *mean.*			90	49	146
TLCO% predicted *mean.*			46	11	89
Oxygen saturations (%), At rest on room air, *mean.*			96	92	98
On Oxygen			3		
On Antifibrotics			17 (59)		
	Nintedanib		13 (76)		
	Pirfenidone		4 (24)		
Clinical Frailty Score (CFS) *mean.*			5	3	6
CFS score	4 or under 0		11		
	5 (mild frailty)		8		
	6 (moderate frailty)		10		
	7 + (severe frailty)		0		
GAP score		1-3 stage I	10 (35)		
		4-5 stage II	12 (41)		
		6-8 stage III	5 (17)		
		Missing data	2 (7)		

Key: Clinical Frailty Score (CFS) Minimum 1, not frail; Maximum 9, most frail, terminally ill. GAP score using (GAP score): gender, age and physiology, comprising FVC% and DLCO% It identifies three stages of severity: a 1-year mortality risk of 6%, 16% and 39% respectively (Ley et al., (2012)

within our department, and incorporation of frailty assessments into routine clinical care. We will refer our moderately frail patients to existing local services with the aim of reducing hospitalisations and death.

REFERENCES

1. Clegg A, *et al*. Frailty in elderly people. *Lancet* 2013;**381**:752–62.
2. Marincowitz C, et al. Can patient frailty be estimated from inpatient records? A prospective cohort study. *Advances in Geriatric Medicine and Research* 2019: e200004. ISSN 2632-9921 10.20900/agmr20200004

Clinical developments in non-invasive ventilation and sleep

P8 A RETROSPECTIVE COHORT STUDY OF IDIOPATHIC DIAPHRAGMATIC PALSY: A DIAGNOSTIC TRIAD, NATURAL HISTORY AND PROGNOSIS

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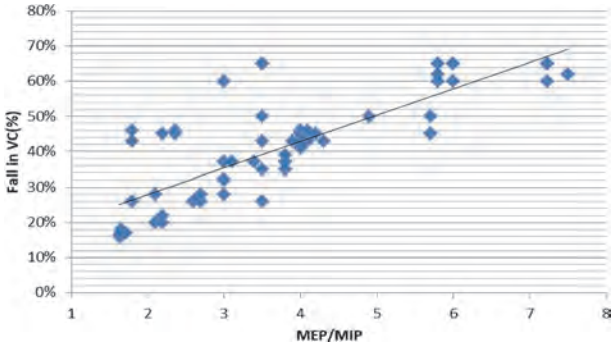
10.1136/thorax-2021-BTSabstracts.118

Background Isolated diaphragmatic palsy (DP) in the absence of progressive neuromuscular disease is uncommon. It poses diagnostic challenges and limited data are available regarding prognosis. We present retrospective cohort data referred for non-invasive ventilation (NIV) from two large teaching hospitals in the United Kingdom.



Abstract P8 Figure 1 Scatterplot of MEP/MIP against fall in seated supine VC at presentation in subjects with diaphragm paralysis (p <0.05, r2=0.76)

Method Sixty patients who were assessed either as inpatients or outpatients were included in this study. Patients with progressive neuromuscular disease were excluded. Clinical presentation, tests of respiratory muscle function (sitting/supine vital capacity [VC], Maximal Expiratory Pressure [MEP], Maximal Inspiratory Pressure [MIP] and Sniff Nasal Inspiratory Pressure [SNIP]) and outcomes were recorded.

Results For patients with DP, mean±standard deviation (SD) seated and supine VC, pre-non-invasive ventilation (NIV) were reduced at 1.7±1.2L and 1.1±0.9 L, respectively, with a mean±SD postural fall in VC of 42±0.16%. The mean MEP/MIP and MEP/SNIP ratios for diaphragmatic palsy (DP) were 3 and 3.5, respectively.

After a year of treatment with NIV, mean±SD upright and supine VC had increased to 2.1±0.9 and 1.8L±1L, respectively, and the mean±SD fall in VC sitting to supine reduced to 29 ±0.17%. MEP/MIP and MEP/SNIP ratios reduced to 2.6 and 2.9, respectively, from the pre-NIV values. The values of postural fall in VC correlated (p <0.05) with MEP/MIP and MEP/SNIP ratio (r2=0.86 and r2=0.7 respectively).

Conclusion Tests of respiratory muscle strength are valuable in the diagnostic workup of patients with unexplained dyspnoea. A triad of a) orthopnoea, with b) normal lung imaging and c) MEP/MIP and/or MEP/SNIP ratio $\geq$ 3 points towards isolated DP. This needs to be confirmed by prospective studies.

P9 DEVELOPING AN INTRASALIVARY BOTOX SERVICE FOR PATIENTS RECEIVING LONG-TERM VENTILATION (LTV) AT HOME: A SINGLE CENTRE EXPERIENCE

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Introduction Sialorrhoea is a debilitating symptom in neurological disease and there is a growing literature for the use of intrasalivary Botulinum Toxin (botox) injections in its management. The SIAXI trial showed a significant improvement in salivation with intrasalivary botox in patients who had Parkinson's Disease.[1] However, provision of intrasalivary botox remains inconsistent and sialorrhoea is often poorly controlled in Motor Neuron Disease. Sialorrhoea in association with bulbar dysfunction can cause intolerance of LTV and respiratory infection, so its implementation is critical within a home

Abstract P9 Table 1

Diagnostic Group	Number of Patients
MND	28
Cerebral Palsy	7
Congenital Muscle Disease	7
Cuff deflation	8
Other	9

ventilation service (HVS). This treatment can also be used to enable deflation of cuffed tracheostomies to facilitate weaning from ventilation. We report on the outcomes of intrasalivary botox in our HVS.

Methods In 2015, we set up an intrasalivary botox service for patients under our HVS. We used ultrasound guidance and injected submandibular gland (SMG), parotid gland (PG) or both.

Results 92 intrasalivary botox procedures were performed in 59 patients.

Prior to treatment with botox, 32% of patients had received hyoscine and 76% had received glycopyrronium. Glands injected were, SMG (6.5%), PG (42.4%) and both SMG and PG (51.1%). The majority (98.9%) received the Dysport preparation with mean dose 273 Units (range 150–500 Units). 92% were USS guided. 63% of injections resulted in subjective improvement in symptoms, with 28% patients requesting repeat injections after a mean of 4.1 months.

Complications were angioedema (1%) and worsening dysphagia (2.2% following SMG injection).

One patient received salivary radiotherapy and one patient underwent SMG excision to avoid repeated injections.

Median survival following initial treatment was 27 months with 42% patients still alive at the time of writing.

Conclusions Intrasalivary botox appears effective across a range of neurological conditions requiring LTV with few complications. 63% of patients noticed symptomatic improvement and nearly 30% opted for repeated treatment. Dysphagia may be a complication of SMG injection. A randomised controlled trial may help establish the evidence base.

REFERENCE

1. SIAXI: Placebo-controlled, randomized, double-blind study of incobotulinumtoxinA for sialorrhoea. *Neurology* 2019;**92**:e1982–91.

P10 EXPLORING INFORMATION NEEDS OF PATIENTS WITH SEVERE CHRONIC OBSTRUCTIVE PULMONARY DISEASE REQUIRING HOME NON-INVASIVE VENTILATION

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10.1136/thorax-2021-BTSabstracts.120

Introduction The benefits of home non-invasive ventilation (NIV) in patients with chronic obstructive pulmonary disease (COPD), including association between compliance and outcomes, is becoming increasingly well evidenced. With other treatments for COPD, such as inhaled treatments, improved patient understanding and education has been positively associated with compliance. However, little is known about patients' understanding of NIV and how this may impact compliance with treatment.

Aim To explore patients' understanding of NIV and their information needs.

Methods A postal questionnaire exploring the understanding of home NIV through both quantitative and free text responses was sent out to all patients with COPD established on home NIV within a large regional service. Quantitative data were recorded and analysed in Excel and thematic analysis of qualitative data was undertaken.

Results 46% (90/197) of postal questionnaires were returned. Although 86% felt confident using NIV, 40% reported needing help (family support 83%, professional carers 17%). 92% stated that they knew how NIV helped them, yet free text explanations often highlighted a lack of understanding. Four key areas were identified using thematic analysis:-

Breathing and sputum: Patients reported that NIV helped by supporting their breathing, including 'regulating breathing rate', 'opening up airways' and 'expanding the lungs'. Some patients understood NIV worked by helping them to bring up sputum more easily.

Sleep: Some patients reported that NIV worked by helping them sleep, including improving morning headaches and disorientation.

Gases: Some patients described NIV reducing carbon dioxide (CO2) levels by 'forcing' CO2 out of their body and 'cleaning' CO2 out of the blood. Others thought that NIV put oxygen into their bodies.

Information needs: Patients described not knowing enough about what to do when unwell; using their NIV machine and making changes to treatment. Patients reported that specific information resources such as a pamphlet (62%) or online resources (36%) would be beneficial.

Conclusions Amongst this cohort of patients we identified variable understanding of home NIV and a need for specific, patient-centred information. More work is required to fully understand the experiences and unmet information needs of this patient group, to inform development of information resources that meet these needs.

P11 A SURVEY OF COPD PATIENTS SELF-REPORTED SLEEP PROBLEMS

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10.1136/thorax-2021-BTSabstracts.121

Introduction Many patients with chronic obstructive pulmonary disease (COPD) report poor quality sleep. Sleep disturbance may be attributed to a range of factors including cough, wheeze, needing inhaler, snoring or anxiety. It is recommended that patients with poor quality sleep undergo further investigation through clinical interview/questionnaires and overnight sleep studies (McNicholas et al. 2019).

Methods An electronic survey was designed to explore the sleep issues experienced by people with COPD and whether they had discussed these with healthcare professionals. In May 2021, a national respiratory society promoted this survey over email and social media. The survey was advertised to people who had issues with their sleep and a diagnosis of COPD.

Results There were 330 survey responses: 292 had COPD. 96% of people with COPD reported issues with sleep. Symptoms reported: feeling unrefreshed (70%), nocturia (63%),

snoring (40%), choking (25%), apnoeas (20%), wheeze (32%) and insomnia (53%). Only 43% had spoken to a healthcare provider about their sleep issues and many added they were not given the support they needed. Only 16% had been diagnosed with obstructive sleep apnoea (OSA).

To further assess sleep problems, 62% said they would have been interested in a sleep study, 49% in questionnaires to further assess sleep problems. Of the 57% of respondents who hadn't spoken to their healthcare provider, 70% reported they would like to speak to someone about their sleep issues.

Respondents would regard a good outcome for sleep interventions as: better nights sleep (86%), feeling more refreshed (75%), having more energy (73%), and feeling less sleepy (60%).

Conclusions Despite the high prevalence of sleep problems self-reported in people with COPD, only 43% had sought healthcare professional input. Responses highlight possible underlying undiagnosed OSA in some. Patients with sleep issues want to discuss these further and are willing to undergo investigations. Future research could improve pathways to identify patients requiring sleep evaluation within routine COPD clinics.

REFERENCE

1. McNicholas WT, Hansson D, Schiza S, et al. Sleep in chronic respiratory disease: COPD and hypoventilation disorders. Eur Respir Rev 2019;28:190064 [https://doi.org/10.1183/16000617.0064-2019]

P12 IMPLEMENTATION OF A COMPUTER GUIDED SLEEP CONSULTATION WITH AN INITIAL TECHNICIAN REVIEW ALLOWS EARLY CHARACTERISATION AND PRIORITISATION OF PATIENTS FOR MANAGEMENT

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10.1136/thorax-2021-BTSabstracts.122

Background The Liverpool Sleep Centre provides secondary and tertiary level services for sleep disorders. We recently introduced a computer guided consultation (CGC); the CGC has comprehensive, sleep guideline based, clinical decision support system (CDSS) algorithms embedded throughout and creates an Electronic Patient Record. The initial review is by a sleep technician; in proof of principle work, this was as effective as specialist sleep physician assessment. The system also has also a 'clinical dashboard' designed to highlight patients of concern and facilitate multi-disciplinary team management. We wished to examine the discriminatory value of the technician review particularly in identifying those needing prompt management.

Methodology To confirm faced validity we reviewed the dashboard alerts in patients from March 1st to June 22nd 2021 following CGC implementation. 326 patients with suspected Obstructive Sleep Apnoea(OSA) were assessed using the CGC; 170 male, mean(SD) age 49.1 (14.1) years, BMI 35.9(9.3). The risk profiling of the patients was reviewed; 326 people had an initial consultation at the time of analysis 42 had incomplete sleep study data.

Results Of the 284 with sleep study results, average ESS was 10.5, mean(SD) AHI 18.7 (19.6). A diagnosis of OSA(S) was given in 196 (69%), 51 (16%) had normal polygraphy and in 37(13%) further review was advised. Regarding overnight oxygen saturations 173(61%) had an average $< 94\%$, 98 had >20 minutes SpO2 $< 90\%$. 132 had bicarbonate recorded with 49 $\geq$ 27mmol/L. There were 223 drivers, Group 1=212; Group 2=8; drivers reporting sleepiness when driving 26 of 223 (12%) (Group 1=24/212; Group 2=1; Provisional=1).

Conclusion The implementation the CGC with standardised consultations and dashboard management system resulted in the identification and prioritisation of sleepy drivers including 8 Group 2 (HGV) for prompt management. Twenty four people (8%) had definite evidence of obesity hypoventilation SpO2 $<90\%$ for $>$ 20 mins and bicarb $\geq$ 27. Only 37(13%) were identified as needing further sleep specialist diagnostic review. The CGC approach in real life performs as was seen in the validation work. The approach increases the capacity and capability of a department by allowing safe delegation of a significant proportion of initial assessments.

P13 SYMPTOMS PREDICTIVE OF SLEEP DISORDERED BREATHING IN POST-POLIO SYNDROME

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10.1136/thorax-2021-BTSabstracts.123

Introduction Post-polio syndrome (PPS) can affect patients decades after initial polio-virus infection and is characterised by new slow onset neuromuscular weakness, fatigue and pain. Hypoventilation is a feature when respiratory muscle weakness occurs. We assess the relationship between symptoms of PPS to diagnosed sleep disordered breathing (SDB) in form of obstructive sleep apnoea (OSA) and hypercapnic respiratory failure (HRF) in a cohort of patients referred to PPS specific self-management education programme.

Abstract P13 Table 1

	No SDB			OSA		
IPPS Variables	*B*	χ^2	OR (95% CI)	*B*	χ^2	OR (CI 95%)
Pain	.045	.479	1.046 (.921-1.187)	-.015	.034	.985 (.844-1.151)
Atrophy	-.028	.052	.973 (.767-1.233)	-.106	.528	.899 (.675-1.198)
Temperature	.090	.192	1.094 (.732-1.633)	.005	.001	1.005 (.626-1.614)
Bulbar	-.332	5.857	.717 (.548-.939)*	.003	.000	1.003 (.726-1.387)

Multi-nomial logistic regression with HRF as reference population; *p<0.05

Methods Retrospective analysis of a cohort of patients with completed PPS in a national tertiary referral centre who completed the PPS self-management programme from 2006 to 2019.[1] Physical symptoms were assessed via the Index of Post-Polio Sequelae (IPPS) questionnaire. Multi-nomial logistic regression was used to assess IPPS sub-domains of pain, atrophy, bulbar and temperature changes in relation to SDB diagnoses (no treatment; OSA; HRF) using HRF as reference group. Age and symptom score presented with mean and range.

Results 168 participants (108 female) were included: 136 required no treatment for SDB (age: 62.8; 34–85), 20 (11.9%) with OSA (60.0; 43–73), 12 (7.1%) with HRF (64.7; 47–79). HRF suffered greater bulbar symptoms (score out of 10) compared to no treatment group (4.5(2–8) vs 2.7(0–10)) but was no different to OSA (4.5 vs 4.3(0–8)). No significant relationship was found between pain, atrophy and temperature sub-domains to SDB diagnoses in multi-nomial regression analysis (table 1).

Conclusion Bulbar symptom domain in IPPS (including respiratory symptoms) predicted diagnosis of SDB independent of other symptom domains including general muscle atrophy. However, it does not differentiate between OSA and HRF. Patients with any bulbar or respiratory symptoms should be referred for SDB assessment with particular focus on hypercapnic respiratory failure.

REFERENCE

1. Curtis A, Lee JS, Kaltsakas G, et al. JTD 2020 'The value of a post-polio syndrome self-management programme'.

P14 THE ROLE OF A VENTILATION MULTIDISCIPLINARY TEAM MEETING (VMDT) IN OPTIMISING CRITICAL CARE RESOURCE-USE

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Introduction Critical care beds are a scarce, valuable resource needing optimisation. Discharge delays result in high occupancy rates, reduced service efficiency and responsiveness, reduced bed availability and increased costs. Number/proportion of critical care level 1 bed days (table 1) were, therefore, highlighted as an NHS quality indicator. Discharge strategies are required to prevent transfer delay of patients without level 2/3 bed day needs. We previously reported a reduction in level 1 bed days and discharge delay following introduction of a weekly physician-led Ventilation Multidisciplinary team meeting (VMDT) (April 2014).[1] Organisational changes have since lead to VMDT cessation (August 2017). We aimed to investigate the impact of VMDT cessation on level 1 bed-days.

Methods Local ICNARC data was analysed before and after VMDT cessation, ((1/8/2014–31/8/2016; Period 1) and (1/8/2017–31/07/2019; Period 2), respectively). Delay in discharge was defined as critical care patients with level 1 needs remaining in critical care >24 hours.

Results There was an increase in number of level 1 bed days in critical care after VMDT cessation from 45/767 discharges (5.9%) in period 1, to 75/818 discharges (9.2%) in period 2 ($p < 0.002$). This corresponded with an increase in delayed discharges from 33 (4.3%) in period 1, to 96 (11.7%) in period 2 ($p < 0.001$).

Abstract P14 Table 1 The 2001 Department of Health (UK) definitions of critical care levels

Level 0	Normal ward-based care in an acute hospital
Level 1	Patients at risk of deteriorating or those relocated from a higher level of care.
Level 2 [also known as 'High Dependency Units' (HDU)]	Patients that may need more detailed frequent observation or intervention, including support for single failing organ support.
Level 3 [also known as 'Intensive Care Units' (ICUs) or 'Intensive Therapy Units' (ITUs)]	Patients that require advanced respiratory support alone ± multiorgan support.

Department of Health. Comprehensive Critical Care: a review of Adult Critical Care Services. May 2000.

Conclusions A reduction in Level 1 bed-days following VMDT introduction was previously demonstrated,[1] without similar contemporaneous reduction in the similarly sized sister hospital, under same hospital management with identical policies, but no VMDT.[2] Our present results, demonstrating increased level 1 bed days following VMDT cessation, add further support to its importance in facilitating timely discharge and suggests adoption of a Physician-led MDT approach would be advisable for general critical care units. We see this as one of many tools in facilitating flow across critical care units and the wider hospital.

REFERENCES

1. Santana-Vaz N, et al. Effect of a weekly ventilation multidisciplinary meeting on respiratory patients' journey through intensive care – a retrospective observational study. *JICS*. 2015;16(1):52–53.
2. Bishopp A, et al. Comparison of the effect of a ventilation multidisciplinary meeting on utilisation of critical care resources. Thorax 2015;70(Suppl 3):A235.2–A235.

P15 THE IMPACT OF COVID-19 ON RESPONSE TIMES FOR ACUTE NON-INVASIVE VENTILATION SET-UPS

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Introduction Acute non-invasive ventilation (NIV) is a life-saving treatment and early therapy improves physiological outcomes, reduces intubation rates and shortens length of stay in hypercapnic exacerbations of chronic obstructive pulmonary disease (COPD). A new 2018 BTS quality standard indicates that patients meeting evidence-based criteria should be started on NIV treatment within 60 mins of their decision-making arterial blood gas (ABG). The National Improvement Objective is >60% of patients meeting this target. We aimed to audit the local NIV set up times before and after COVID-19 to generate insights for ongoing quality improvement.

Methods Data was extracted from our NIV unit's quality database for two time periods before and after the start of the COVID-19 pandemic, 1st April – 1st September 2019 and 2020, respectively. Continuous variables were compared using a Mann-Whitney U test and categorical variables using Chi-Squared test.

Results Total numbers of patients receiving NIV decreased by 45.8% from 2019 to 2020 (83 vs 45 patients) with a 37.7% drop in number of COPD patients (53 vs 33). The Median (Interquartile range (IQR) time from decisive ABG to NIV set-up was 61 mins (34) in 2019, which increased to 132 mins (113) in 2020 (P<0.0001). Notably, the proportion of patients meeting the BTS target decreased from 48.7% to 23.7% (P<0.0001). The number of critical care set ups decreased from 9 to 1 (P=0.0232). Moreover, the proportion of patients who completed NIV decreased by 68.8% (48 vs 15) (P=0.0081), with number of deaths increasing by 50% (4 vs 8) (P=0.0136).

Conclusions The reduction in patient numbers receiving NIV for acidotic respiratory failure is likely due to a decrease in acute COPD exacerbations. However, NIV set up times significantly increased, reflecting the stringent COVID-19 infection control measures around aerosol generating procedures. We report a decrease in critical care set ups and an increase in deaths in 2020, highlighting excess deaths in patients receiving NIV subsequently found to be due to COVID-19. Given ongoing infection controls, global restructuring and improvement of patient flow through hospitals may be required as part of future quality improvement for decreasing response times for acute NIV set-ups.

P16 EFFECT OF HUMIDIFIER TEMPERATURE DURING HIGH FLOW NASAL THERAPY ON CONCURRENT AEROSOL DRUG DELIVERY WITH A VIBRATING MESH NEBULISER

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High flow nasal therapy (HFNT) is commonly used to treat patients that require supplemental oxygen and prescribed lung targeted aerosol drug delivery. Humidifier temperature may impact the percentage of drug dose delivered to patients. This study investigates the effects of humidifier temperature, 34°C v 37°C, during HFNT on the performance of a vibrating mesh nebuliser (VMN) (Aerogen Solo, Aerogen, Ireland).

A 2.5ml dose of 2mg/ml of salbutamol was nebulised using a VMN with the Airvo2 HFNT system via the nebuliser adapter (Fisher & Paykel, New Zealand). A capture filter was placed distal to the nasal prongs of an adult nasal cannula (OPT944) and emitted dose characterised at 10, 30 and 60 LPM. Drug dose was determined by quantifying the mass of drug captured on the filters using UV spectrophotometry at 276 nm.

Abstract P16 Table 1 Emitted dose (%) for VMN in combination with the Airvo2 at 34°C and 37°C

	Emitted Dose (%) (Average ± SD)		
Flow rate	Temperature 34°C	Temperature 37°C	P-Value
10LPM	33.79 ± 1.72%	33.34 ± 2.42%	0.810
30LPM	30.25 ± 2.98%	28.50 ± 0.70%	0.430
60LPM	19.17 ± 1.15%	18.88 ± 0.52%	0.732

Results of this work indicate that the humidifier temperature setting has no significant effect on the emitted aerosol drug dose across flow rates. Consequently, the clinician has the option to adjust temperature without concerns around altered aerosol dosing.

P17 CHARACTERISTICS AND OUTCOMES OF PATIENTS WITH SPINAL CORD INJURY REQUIRING MECHANICAL VENTILATION AT A SPECIALIST VENTILATION CENTRE, 2010–2019

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Introduction Patients with spinal cord injury (SCI) often require complex ventilatory management but limited data exist on this cohort of patients. We sought to characterise the cohort of SCI patients who have received mechanical ventilation at our tertiary ventilation centre.

Methods A retrospective database evaluation of all patients referred to our centre between 2010 and 2019 with SCI and respiratory failure.

Results 205 adults (65% male) were evaluated. Median(IQR) age at time of injury was 43(24–66) years. 84% suffered a high cord injury (C1-C5) and 16% suffered a lower cord injury (C6 and below). Patients suffered from ASIA Grade A (70%), Grade B (16%), Grade C (10%) and Grade D (4%) injuries. 8% patients were successfully weaned from all mechanical ventilation prior to discharge. 87% of patients were established on long-term home mechanical ventilation: 50% with IMV, 37% with NIV. 4% of patients died prior to hospital discharge. 74% of patients were discharged with mechanical insufflation-exsufflation therapy. Regarding discharge destination, 67% were discharged to their home however, due to high multi-disciplinary care needs, 7% were discharged to a rehabilitation hospital and 25% were discharged to a nursing home. Time to death following injury was 5(2–19) years, with age at death of 67(56–73) years. Time to death following injury was 22(3–26) years in the NIV cohort and 7(2–12) years in the IMV cohort. Patients remained under specialist follow-up from our unit for 4(2–7) years.

Conclusion The majority of patients referred with respiratory failure following SCI who survive to discharge are successfully established on long-term ventilatory support. One quarter require care in long-term residential facilities. Three-quarters are provided with mechanical insufflation-exsufflation therapy to aid secretion clearance. Median survival is considerably longer in SCI patients than other groups requiring long-term mechanical ventilation,[1] indicating a need for long-term management strategies to maximise functional capacity and improve health-related quality of life in this patient population.

REFERENCE

1. Patout M, Lhuillier E, Kaltsakas G, *et al*. Long-term survival following initiation of home non-invasive ventilation: a European study. *Thorax* 2020;**75**:965–973.

Virtual monitoring in COVID-19

P18 SAFETY AND EFFECTIVENESS OF AN INTEGRATED, TELEHEALTH-LED SUPPORTED DISCHARGE SERVICE FOR COVID-19

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Introduction and Objectives The Covid-19 pandemic has driven forward a number of remote monitoring schemes (virtual wards) across the country to support the early discharge of patients with covid-19. Technology can assist clinical teams to deliver comprehensive care in the community. In this study we aim to evaluate the safety and effectiveness of an innovative, telehealth-led virtual ward for Covid-19.

Methods Patients discharged from hospital respiratory wards with a diagnosis of Covid-19 and deemed at risk of readmission (or requiring home oxygen weaning) were eligible for referral. Monitoring equipment (thermometers and digital pulse oximeters) was provided and patients were on-boarded into a telehealth platform prior to discharge. Smartphones and tablets were supplied by the service if required. A Covid-19 digital clinical question set and triaging algorithm was developed locally. Patients were instructed to complete it daily remotely during follow-up and to enter their observations three times daily. Clinical data fed into a dashboard reviewed daily by the community respiratory specialist team who would contact and assess patients submitting symptoms of concern. Monitoring lasted for up to 14 days, and escalation processes to the acute Trust were in place for those patients showing evidence of deterioration.

Results 218 patients were monitored between December 2020 and May 2021, 29 for oxygen weaning. 41% were female, mean age 57 years old (minimum 21, maximum 89). Average oxygen weaning time was 11 days, with 319 days of hospital bed days saved by the oxygen weaning service and an estimated £127,600 cost saving to the system. Only 10 patients (4.9%) were readmitted after 14 days (versus 9% in usual care from hospital Covid-19 wards). Four patients (1.8%) died in hospital after a readmission. 83% of patients felt 'very supported' by the service and 73% expressed that it had 'fully' improved their confidence. Average score of satisfaction with the service, measured by a self-reported questionnaire, was 9.9/10.

Conclusions A telehealth-assisted remote monitoring service for Covid-19 is a safe way to provide specialist care at home and can reduce hospital readmissions whilst improving patient experience.

P19 COVID VIRTUAL WARD AND EMERGENCY DEPARTMENT DISCHARGES: CLINICAL OUTCOMES AND RECOMMENDATIONS FOLLOWING COVID PANDEMIC PHASE 2

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Introduction In wave 2 of the pandemic, the Virtual COVID Ward (VCW) was expanded to include Emergency Department (ED) as well as ward discharges with COVID pneumonitis. Outcomes of ED COVID patients have been reviewed and key recommendations drawn to inform practice in endemic phase COVID.

Methods A retrospective review of persons attending ED who were not admitted with COVID illness (COVNA) was undertaken to assess safety and clinical effectiveness of the VCW between 01/10/2020–01/04/21. Demographic data was collected as well as clinical outcomes including mortality and admission rates.

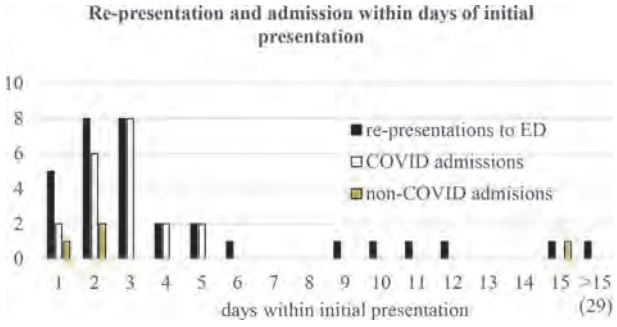
Results 119 COVNA patients identified (female 65 (55%); 77 (66%) BAME; median age 51 years, IQR 38–62, range 16–88). Over half (55%) were between the ages 40 and 69. COVNA patients were relatively free from co-morbidity: 104 (87%) had low or intermediate risk ISARIC 4C scores; all had Charlson co-morbidity score of less than 9 representing low 10 year mortality.

Median length of stay on VCW was 3 days (IQR 3–8, range 0–15); median number of calls undertaken was 3 (IQR 2–5, range 0–9).

32 (27%) COVNA patients returned to ED, 8 of whom were discharged home with an overall admission rate 20%. Re-presentations within 5/7 were predominantly COVID related (20/23; 87%). After 5 days, there were no attendances with worsening pneumonitis (figure 1). The commonest route for re-attendance was self-referral (17/32; 53%) of whom 14 were admitted; all 10 persons referred to ED from VCW were admitted.

COVNA patients issued with a saturation probe (48%) were more likely to re-present and be admitted (RR 2.2; 95% CI 1.03–4.74; p0.0425).

2 (1.7%) sustained pulmonary emboli; 1 intensive care admission; 4 patients died (3% unadjusted mortality).



Abstract P19 Figure 1

Conclusions COVNA patients have low mortality and morbidity from COVID. The VCW model has safely and successfully supported COVNA patients who are deemed fit enough to not require admission (clinical judgment and no oxygen requirement). Ideally, all COVNA patients should be issued with a saturation probe. COVNA patients should be warned that re-presentation and admission may be required. Worsening of symptoms and/or a drop in oxygen saturation should warrant return to ED. This pathway should be continued in COVID endemic phase.

P20 COVID SUPPORTED DISCHARGE: A LIVERPOOL EXPERIENCE

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Introduction The Liverpool Community Respiratory team (CRT) is a multi-professional team supporting patients with COPD exacerbations to reduce hospital admissions and length of stay. During the first wave of the Covid 19 pandemic, CRT piloted a service to support and monitor patients hospitalised with covid 19 pneumonia on discharge. Patients were provided with telehealth equipment for remote physiological monitoring, and were called daily by a member of the team.

Results 157 patients (87 male, mean age 59.7, range 21–88) were supported by the CRT covid discharge service between May 2020 and May 2021. 11 (7%) were readmitted, 4 withdrew and 1 died at home. 141 completed 10–14 days of support.

Mean hospital stay was 13.7 days (range 11–112). 8 were current smokers, 52 were ex smokers and 87 had never smoked. Mean BMI was 31.4 (range 18.5–54.5).

Chair based exercises were introduced early and 141 were offered pulmonary rehabilitation, of whom 135 (95.7%) agreed to a referral; only 6 declined.

Feedback from all patients supported by CRT was positive.

We noted that anxiety levels improved subjectively during the period of CRT support so introduced GAD7 to further assess this. Although 28 patients achieved the minimal clinically significant difference, this was not seen consistently across the group.

Conclusions Supported discharge after hospitalisation with covid pneumonia is safe and well-liked by patients. Readmissions were rare and pulmonary rehabilitation uptake was high. There may be some benefit in term of anxiety management, but numbers were too low for this to be proven.

P21 DEVELOPMENT OF A COVID-19 VIRTUAL WARD TO FACILITATE EARLY DISCHARGE FROM HOSPITAL FOR PATIENTS WITH AN ON-GOING OXYGEN REQUIREMENT

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Introduction and Objectives The COVID-19 pandemic required rapid service changes in order to meet the emerging needs of our patients and to reduce pressures on hospital beds. In March 2020 we established one of the first virtual wards with the aim of supporting patients with a continuing oxygen requirement safely at home during their COVID-19 illness.

Methods The virtual ward was delivered by the integrated care ImpACT+ service. This multi-disciplinary service comprises respiratory consultants, respiratory specialist nurses, physiotherapists, occupational therapists and fitness instructors. Our local criteria for on-boarding included: 10 days post onset of symptoms, oxygen requirement 4L or less and the ability to manage with home monitoring equipment. A mix of telephone and home contacts were offered and daily consultant MDTs undertaken. Therapy team members were upskilled to support oxygen assessments and weaning regimes to maximise service capacity. A direct electronic referral icon was created on the hospital whiteboard system accompanied by a nurse-led telephone referral service. The scheme was advertised through posters and in-reach work into COVID-19 areas.

Results 107 patients were managed on our virtual ward since March 2020. This included 99 COVID-19 patients and 8 with other acute respiratory exacerbations. The mean continuous oxygen prescription on discharge was 1.5 L (range 0.5–4L) and for ambulatory purposes 2.4L (1–6L). 55 patients with COVID-19 were discharged on anticoagulation, 33 on steroids and 21 on antibiotics. 8 30-day readmissions, 3 deaths (2 expected). The total number of bed days on the virtual ward was 2010 (mean 21 days) and in total the activity that service delivered included 904 telephone calls and 274 home visits. Service feedback demonstrated a high level of satisfaction with patients commenting that they valued being at home with support during their recovery.

Conclusions This service has shown a supported discharge Covid-19 oxygen weaning service is a valuable initiative to relieve pressures on the acute hospital service and provide high quality care to facilitate early discharge from hospital. This virtual ward highlighted the value of having an integrated respiratory team and extension of this model to other respiratory conditions should be possible with considered adaptions.

P22 EARLY SUPPORTED DISCHARGE WITH DOMICILIARY OXYGEN AND INTEGRATED RESPIRATORY TEAM (DO-IRT) CARE FOR HOSPITALISED SARS-COV2 PATIENTS

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Introduction The SARS-CoV2 pandemic has placed unprecedented pressures on inpatient capacity nationally. An early discharge pathway with domiciliary oxygen and integrated respiratory team support (DO-IRT) was implemented for patients admitted with SARS-CoV2 pneumonia at a large inner London teaching hospital. We report the outcomes and patients' experiences of the DO-IRT pathway.

Methods Inpatient referrals to the 7-day DO-IRT pathway were assessed for clinical suitability between 15-January and 13-April in 2021. Inclusion criteria were patients in South East London boroughs, non-pregnant, able to use pulse oximeter, have a phone, ongoing oxygen requirement (≤2L/min or ≤ 24% Venturi), $PaCO_2$≤6.5kPa, bicarbonate<28mmol/L, non-smoker, medically stable ≥48 hours with improving clinical trajectory (including CRP<50), NEWS≤4, >day 10 from symptom onset, stable SARS-CoV2-related complications (including VTE), dexamethasone completed or weaning plan and blood glucose management plan in situ, and rehabilitation needs addressed. Patients were provided with an information leaflet, monitoring diary and pulse oximeter, and were categorised into supported oxygen weaning at home or a long-term home oxygen (LTOT) pathway. DO-IRT provided home visits on day 1 and day of discharge, with daily telephone review and multi-disciplinary team discussions. Patients reported their experience in a satisfaction survey.

Results 24(22%) of 109 referred inpatients were accepted onto DO-IRT; 22/24(92%) for oxygen weaning and 2/24(8%) for LTOT. Clinical characteristics are shown in table 1.

Abstract P22 Table 1 Clinical characteristics of patients in DO-IRT pathway

		All (n=24)	LTOT* (n=2)	Oxygen weaning (n=22)	
				Concentrator and ambulatory oxygen (n=16)	Ambulatory oxygen (n=6)
Age (years)		64 (51-73)	60, 72	64 (54- 74)	54 (48-68)
Gender female/male		9/15	2/0	4/12	3/3
Entry to DO-IRT (at discharge from hospitalisation)					
Respiratory rate (/min)		19 (18-20)	20, 20	19 (18-20)	19 (18-20)
Oxygen flow rate (L/min)	Concentrator	N/A	4, 3	1.0 (1.0-1.4)	N/A
	Ambulatory cylinder	N/A	4, 3	1.0 (1.0-2.0)	1.5 (1.0-2.0)
Length of Stay saved by DO-IRT (days)		N/A	N/A	10*	N/A
Readmission rates		5 (20.8%)	1 (50%)	3 (19%)	1 (17%)
30 day all-cause mortality		0	0	0	0
End of pathway outcome#					
Successfully weaned (no oxygen)		N/A	0	5 (31%)	1 (17%)
Ambulatory oxygen		N/A	0	5 (31%)	4 (66%)
LTOT and ambulatory		N/A	2 (100%)	4 (25%)	1 (17%)
LTOT Oxygen flow rate (L/min)		N/A	3, 2	1.0 (1.0-2.5)	N/A

Data presented as median (IQR) or absolute numbers.
*hospital bed days saved (calculated for weaning cohort only). Represents duration from initiation of pathway to weaning to air at rest.
#2 patients in concentrator and ambulatory cohort were readmitted and discharged without further referral to DO-IRT
* Only 2 patents in cohort, thus all raw values presented

Majority of declined referrals (55%) were patients who were above target saturations on oxygen and were supported to wean to air by IRT as inpatients. Duration on DO-IRT pathway was mean (SD) 16.3(7.2) days; median (IQR) length of stay saved for the oxygen weaning cohort were 9 (7–13) days. All-cause 30-day mortality and readmission rates on DO-IRT were 0% and 21% respectively. 14(58%) patients completed the satisfaction survey; 14(100%) reported confidence in their care and were 'extremely likely' to recommend DO-IRT.

Discussion Early supported discharge with home oxygen weaning for SARS-CoV2 pneumonia patients is feasible, safe and well-received by patients. Integrated respiratory teams with specialist oxygen expertise can make a valuable contribution to supporting acute medical flow. Future studies should investigate the feasibility of supported early discharge pathways with domiciliary oxygen in other conditions.

P23 IMPLEMENTING A DAILY VIRTUAL COVID-19 MULTI-DISCIPLINARY TEAM MEETING IN SECONDARY CARE

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10.1136/thorax-2021-BTSabstracts.133

Introduction In the UK, over 450, 000 people have been admitted to hospital with COVID-19, but co-ordinated MDT meetings to discuss cases, with combined respiratory, radiology and microbiology input have not been widely adopted, despite increased use of virtual MDT platforms in other specialties. This is surprising, given at times there is both diagnostic uncertainty, with low sensitivity of both nasal (63%) and throat (32%) COVID-19 RT-PCR tests and nuance around treatment decisions in these patients.

Aims and Methods We conducted a review of a virtual MDT (vMDT) set up and delivered daily (including weekends) over Microsoft teams to discuss management of inpatient COVID-19 from September 2020 to February 2021 (1012 patients, mean 8.5 cases/meeting). We conducted a retrospective case note analysis of 210 subjects, recording the RT-PCR result, radiological appearances (BSTI criteria) and decisions regarding investigation for VTE. Alongside this we conducted a qualitative survey (0–10 satisfaction) of 20 members regularly attending MDT members.

Abstract P23 Table 1

Radiological Code (n=200)	Positive COVID-19 RT-PCR (n= 162, 81%)	Negative COVID-19 RT-PCR (n = 38, 19%)
CVCX0 (Normal appearances)	3 (1.5%)	6 (3%)
CVCX1 (Classical/Probable COVID-19)	103 (51.5%)	8 (4%)
CVCX2 (Non-classical/intermediate appearances)	51 (25.5%)	19 (9.5%)
CVCX3 (Atypical – pleural disease/pulmonary oedema/lobar consolidation)	5 (2.5%)	5 (2.5%)

Results Attendance ranged from 5–15 people and always included a respiratory and radiology consultant and microbiology/virology registrar. Of the 200 MDT cases reviewed (n=10 excluded due to inadequate CXR or missing PCR), mean age was 64 years old, 66% were male, 47% BAME ,median LOS was 7 days and inpatient mortality was 41/200 (19%). Over half of cases (54.5%) had both a positive RT-PCR and classic CXR appearances of COVID-19, but n = 5 (2.5%) had atypical features alongside a positive PCR, warranting discussion and consideration of dual pathology (TB/lung cancer/suspected phrenic nerve palsy all suggested). A significant proportion of patients with a negative RT-PCR, n= 8/38 (21%) had radiological appearances that were classical of COVID-19 pneumonitis, prompting appropriate treatment and ward triage (avoiding hospital spread). CTPA was suggested in 16/200 (8%) of patients' and confirmed PE in 5/16 scans. Of those surveyed, > 75% felt that their knowledge of anticoagulation (prophylaxis and treatment) in patients with COVID-19 improved and over 50% of junior doctors' submitted post-MDT work based assessments.

Conclusion The COVID-19 vMDT helped with diagnosis and management of patients during the SARS-CoV-2 pandemic, whilst simultaneously providing education to health care professionals.

P24 COVID-19 ADVANCED RESPIRATORY PHYSIOLOGY (CARP) WEARABLE RESPIRATORY MONITORING: EARLY INSIGHTS

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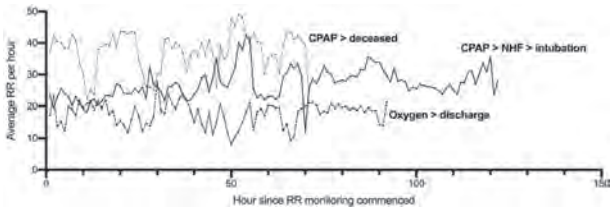
Background Covid-19 presents an urgent need to monitor large number of patients with respiratory failure. Respiratory rate (RR) monitoring can predict deterioration but clinician-based measurements are intermittent, often inaccurate, and frequency of measurements are dependent on level of care



Abstract P24 Figure 1 CARP trial wearable respiratory rate, respiratory support and outcome data from 3 patients with severe COVID-19

required. Wearable RR sensors have been benchmarked against reference sensors. They offer the potential for continuous remote monitoring at scale of patients at risk for deterioration, who may require escalation and respiratory support. In the CARP trial we are exploring feasibility and utility of continuous wearable RR monitoring of inpatients with COVID-19, with the potential of extrapolating this to other causes of respiratory failure in the future.

Method The pre-commercial chest-worn Altair PneumoWave derives continuous RR and detects apnoeas, with processing algorithms benchmarked with reference impedance plethsmography. The device attaches to a standard adhesive ECG 'dot' with bluetooth hub and wi-fi connectivity. Live RR and event data is presented in a co-designed cloud-based dashboard, allowing for remote visualisation and inpatient journey tracking.

Consenting inpatients with PCR-confirmed COVID-19 who required oxygen therapy were screened over an 8-month period. Follow-up was performed at 28 and 90-days post discharge, including post-COVID patient reported outcomes and MRC dyspnoea score.

Results 156 patients were screened, with 77 recruited to the CARP trial. 32 patients required non-invasive respiratory support, of which 14 were escalated to mechanical intubation. 17 patients died within trial.

Bland-Altman analyses of paired RR data confirmed that wearable sensor data shows good agreement with critical care RR monitoring (Phillips Intellivue MX700), and that ward-based intermittent clinician RR measurements were imprecise.

From the initial utility review of CARP physiology data visualisations, rising hourly average RR >25/min is associated with subsequent patient deterioration. Improving and stable hourly average RR of <25/min associates with stable respiratory failure and improvement to hospital discharge (figure 1).

Conclusion Continuous wearable respiratory rate remote monitoring in COVID-19 inpatients is feasible. Planned machine learning and time-series analyses of the detailed physiology and clinical endpoint data will determine appropriate cut-offs and feature importance for deteriorating patient risk predictions. The CARP clinical dashboard provides an infrastructure for future implementation and evaluation of these AI insights.

P25 THE EFFECT OF POST COVID-19 REHABILITATION ON HEALTH STATUS USING THE EQ-5D- 5L

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10.1136/thorax-2021-BTSabstracts.135

Introduction Many patients who have survived COVID-19 are left with ongoing health concerns; be it deconditioning from a prolonged hospital admission or those with long COVID syndrome. Rehabilitation programmes have been developed in attempt to address this but little is understood about its effectiveness. The EQ-5D-5L is a well validated measure of health status and was completed before and after rehabilitation. We aimed to investigate the effect of our rehabilitation programme on health status.

Method All patients attending assessment for post-COVID rehabilitation complete the EQ-5D-5L and is repeated on discharge. Patients attended rehabilitation twice a week for 6 weeks.

Results Between July 2020 and May 2021 136 patients completed post-COVID rehabilitation. Mean age was 56 (12.25). 38% male. Table 1 illustrates change pre and post rehabilitation.

Abstract P25 Table 1 Mean (SD) scores for EQ-5D-5L index pre and post rehabilitation

Pre rehabilitation	Post rehabilitation	change	P value*
0.611 (0.195)	0.733 (0.172)	0.127 (0.187)	< 0.05

Paired t-test

Conclusion Post COVID rehabilitation improves health status in patients following COVID-19 with ongoing health concerns.

P26 KNOWLEDGE SEEKING BEHAVIOUR OF THE COVID-19 POPULATION. ANALYSIS OF THE FIRST MILLION UK USERS OF YOUR COVID RECOVERY®

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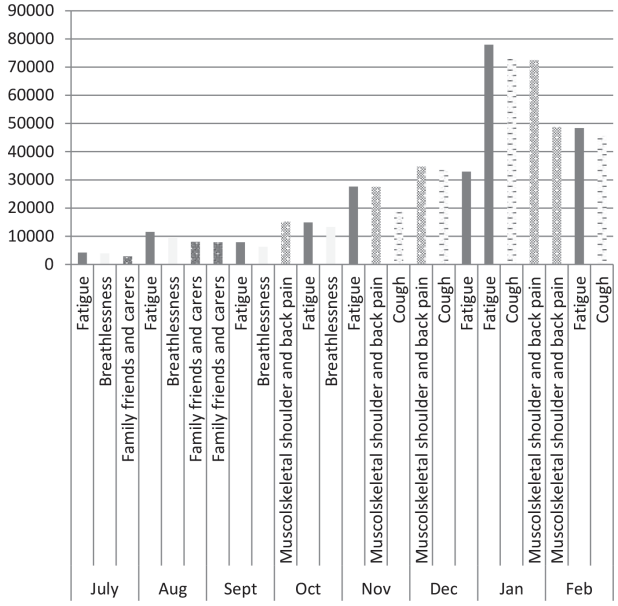
10.1136/thorax-2021-BTSabstracts.136

Introduction University Hospitals Leicester NHS Trust (UHL) in partnership with NHS England worked in collaboration with professional societies, charities and healthcare professionals (HCPs) nationwide to launch the Your COVID Recovery® website (www.yourcovidrecovery.nhs.uk). This site offers information on living with and recovering from the physical and psychological effects of COVID-19. The site has information on the commonly reported post COVID symptoms[1] and was launched in July 2020. The aim was to evaluate website usage and the knowledge seeking behaviour of its readers.

Method The first one million users were analysed using Google Analytics from July 2020 to February 2021, reporting on overall site usage, content page views and length of time spent on the pages. The top three content pages were recorded each month.

Results To reach one million users took seven months, with over 700,000 of these users viewing the site from December 2020 to February 2021.

Retrieval of content data (figure 1) shows that Fatigue was the most viewed page (225,511) followed by Musculoskeletal Shoulder and Back Pain (MSK) (212,312) and Cough (184,178). Fatigue consistently featured every month, whereas Musculoskeletal Shoulder and Back Pain and Cough did not feature until October 2020 and November 2020 respectively.



Abstract P26 Figure 1 Top three page views per month for the first million visits to the Your COVID Recovery Website

Breathlessness and Family, Friends and Carers featured in the top three positions for the first four months but not subsequently.

Of the highest viewed content pages, average length of time spent on an individual page was reported to show Fatigue at 02mins12sec, Musculoskeletal Shoulder and Back Pain at 03mins05sec and Cough at 03min35sec.

Conclusion The data highlights the desire for knowledge on symptom management of COVID-19 with areas of specific interest showing some change during the data collection period. This may reflect the progression or change in symptoms and fluctuating COVID-19 cases nationally. It may also provide HCP's an important insight into the recovery of patients with COVID-19. The average length of time spent on the most viewed pages is high, showing good interaction by the reader and again highlights the desire for knowledge.

REFERENCE

1. Physical, cognitive and mental health impacts of COVID-19 following hospitalisation – a multi-centre prospective cohort study PHOSP-COVID Collaborative Group. *medRxiv* 2021.03.22.21254057. doi:https://doi.org/10.1101/2021.03.22.21254057

P27 THE NEED FOR REHABILITATION PROGRAMME AFTER AN EPISODE OF COVID-19

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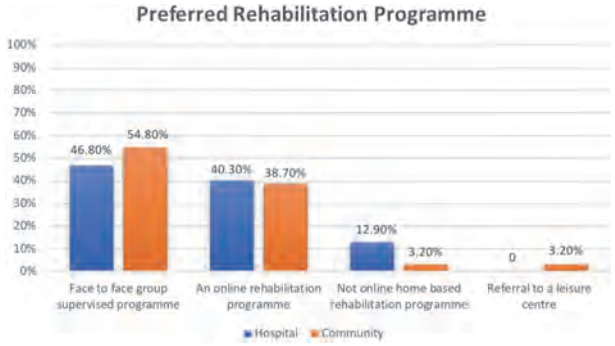
10.1136/thorax-2021-BTSabstracts.137

Background After COVID-19 infection, individuals can experience a variety of symptoms that might require further treatment. Early data showed that an adapted pulmonary rehabilitation programme may be a valuable intervention.[1] It is anticipated that there will be a huge burden on current services to deliver a programme for patients with long term symptoms following COVID-19 infection and therefore there will need to be flexible alternative modes of delivery. Currently no data exists on the need for rehabilitation and the preferred mode of delivery.



Abstract P27 Figure 1 Preferred rehabilitation programme

Aim To assess the need for rehabilitation programme following discharge from COVID-19 episode and understand patient preference.

Method Patients post hospital discharge (H) and the community managed (C) infection received a follow up call on average of 3 months after discharge as a part of routine clinical management. A survey was completed to assess their most significant symptoms they would seek help with and their preference for rehabilitation. The survey explored ongoing symptoms, level of activity and preferred mode of rehabilitation. Data was analysed using SPSS v25.

Results A total of 160 patients completed the survey (51.2% male, mean [SD] age 54 [15] years). 126 (78.8%) were post hospital and 34 (21.3%) were community managed infections. 101 (63.1%) reported that COVID-19 related symptoms have affected their daily activities, and 106 (66.3%) reported their desire to be more active. The most common symptoms identified needing support were fatigue (C- 82.4%, H- 44.4%) and shortness of breath (C- 88.2%, H-48.4%). Both groups preferred face-to-face group programme (C- 54.8%, H- 46.8%), and (C-38.7%, H- 40.3%) preferred a supported digital rehabilitation programme or non-digital home based programme (C- 3.2%, H-12.9%) respectively (figure 1).

Conclusion The survey responses indicate a significant need for a support package of care. The majority preferred a face-to-face intervention; although a significant minority would prefer a digital intervention, regardless of mode there will be a substantial burden on services.

REFERENCE

1. Daynes E, Gerlis C, Chaplin E, Gardiner N, Singh SJ. Early experiences of rehabilitation for individuals post-COVID to improve fatigue, breathlessness exercise capacity and cognition-A cohort study. *Chronic Respiratory Disease*. 2021;**18**:14799731211015691.

P28 DEVELOPING A NOVEL ADVANCED CLINICAL PRACTITIONER LED SEVERE COVID-19 FOLLOW-UP SERVICE – A PICTURE IS NOT ALWAYS WORTH A THOUSAND WORDS

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During the COVID-19 pandemic the British Thoracic Society produced national guidance advising for all severe COVID-19 pneumonia (defining our inclusion criteria as clinico-radiological diagnosis, oxygen requirements >35%, continuous positive pressure ventilation or mechanical ventilation) to have 4–6-

week follow-up with all COVID-19 patients having imaging at 12 weeks.[1] To avoid duplication of work streams, the district general hospital developed a pathway liaising with ICU to ensure follow-up 4–6 weeks post discharge, chest x-ray at 12 weeks and follow-up telephone appointment at six months with the aim of discharging back to the community or referring for further investigations. In total we followed up 272 patients who were referred to our service.

In the first wave (April 2020 - July 2020) we followed up 117 patients of whom 99 had a follow-up chest X-ray. Chest x-rays were performed on average 80.4 (43–140) days post discharge. Of these patients, 14% had residual changes, with 86% having a clinic normal chest X-ray, with 33 (28%) requiring referral for further investigation and respiratory physician follow-up due to breathlessness (quantified by Modified Medical Council Research dyspnoea score) identified at follow-up clinic appointments, on average 168.4 (91–209) days post discharge.

In the second wave (October 2020 – April 2021) we followed up 155 patients of whom 133 had a chest x-ray and 51 (38%) had residual changes. Chest x-rays were performed on average 88.7 (32–120) days post discharge and follow-up clinic appointments were on average 150.9 (92–172) days post discharge. Only 35 patients have been followed up to date (the remaining having not reached 6-months post discharge). Of these 15 (42.8%) required onwards referral for further investigation.

This data shows that we have run a robust follow-up service for severe COVID-19 pneumonia patients. It is important that we think carefully about who is referred for further respiratory investigations as our data shows that chest x-ray resolution does not necessarily correlate with resolution of symptoms, and the implication for NHS services.

REFERENCE

1. British Thoracic Society. *British Thoracic Society Guidance on Respiratory Follow Up of Patients with a Clinico-Radiological Diagnosis of COVID-19 Pneumonia* [V1.2], 2020. https://www.brit-thoracic.org.uk/document-library/quality-improvement/covid-19/resp-follow-up-guidance-post-covid-pneumonia/

Advances in the management of TB and NTM infections

P29 HOW ARE WE MANAGING NON-TUBERCULOUS MYCOBACTERIA PULMONARY DISEASE (NTM-PD)? RESULTS FROM THE FIRST UK-WIDE SURVEY OF CLINICAL PRACTICE

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10.1136/thorax-2021-BTSabstracts.139

Introduction and Objectives The prevalence of pulmonary non-tuberculous mycobacteria (NTM) isolates identified in the UK is increasing. We sought to ascertain the current NTM-pulmonary disease (NTM-PD)-related workload in the UK and the infrastructure in place to support this; and to compare reported NTM-PD management with recommendations outlined in national guidance.

Methods A cross-sectional online survey on the diagnosis and management of NTM-PD was circulated between November 2020 and May 2021 via NTM Network UK, the British Thoracic Society and the British Infection Association to healthcare professionals across the UK who manage patients with NTM-PD.

Results Data from 87 sites were analysed (including 4 paediatric and 12 cystic fibrosis centres). 76/87 (87%) of respondents were consultant physicians, of which 63% were adult respiratory consultants. NTM-related workload is considerable, with 62% of respondents seeing over six newly diagnosed NTM-PD patients each year, in addition to a further 10–20 patients already under follow-up. 41–60% of patients under review are commenced on treatment for NTM-PD.

68 (78%) sites manage NTM patients in TB clinic, whilst 8 have a dedicated NTM clinic. All respondents had access to bronchoscopy, and 66% also to induced sputum diagnostics. Support available from clinical nurse specialists and other allied healthcare professionals varied. 68% have input from TB specialist nurses whilst 14% receive no nursing support. 47% of respondents have support from physiotherapists, 41% from a pharmacist and 33% receive no allied healthcare support.

Of the 66 respondents who do not work at a NTM tertiary referral centre, 42 (64%) do not receive external MDT support from one. 55% of clinicians do not provide or signpost NTM-PD patients to any patient information resources related to NTM-PD.

Conclusions There is significant variation in how patients with NTM-PD are managed across the UK including existing infrastructure for NTM diagnosis and treatment, and a lack of standardised NTM care pathways. Opportunities to improve support to patients and clinicians include: 1) helping centres to set-up NTM-PD multi-disciplinary teams, 2) establishing regional networks and a national NTM-PD Clinical Advice Service and 3) enabling NTM patients to access relevant NTM information and support.

Please refer to page A191 for declarations of interest related to this abstract.

P30 MOBILE HEALTH USES IN SURVEILLANCE OF TUBERCULOSIS MEDICATION SIDE EFFECTS AND BEYOND-A PILOT STUDY

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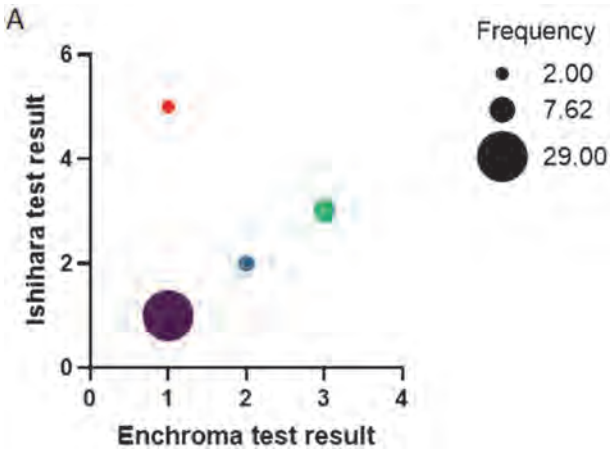
10.1136/thorax-2021-BTSabstracts.140

Tuberculosis (TB) and multi-drug resistant TB (MDR-TB) are some of the most deadly infectious lung diseases worldwide. Medications such as ethambutol and fluoroquinolones, used in treatment, have potentially severely debilitating side effects, namely ocular toxicity. Current monitoring is infrequent and can lead to unnecessary progression of side effects until irreversible or fatal. Mobile health (m-health) may be able to provide suitable solutions.

Methods 196 eyes from 96 participants sourced from St Mary's TB clinics, Western Eye Hospital outpatient clinics, Charing Cross Hospital MS clinics and student volunteers were examined using a digital colour vision test (EnChroma). The results were compared to currently used analogue tests during two phases. Phase one involved comparison to the



Abstract P30 Figure 1 Correlation of EnChroma comparison to Ishihara test, (n=40). Axis numbers correspond to results with EnChroma result on the x-axis and the Ishihara test result on the y-axis. Normal=1, protan=2, deutan=3, tritan=4, unknown=5. Bubble size denotes number of participants.

Farnsworth D15 test (FD15) and phase two to the Ishihara plate test. Participant self-assessment and opinions on the usability of the m-health solution were recorded.

Results There was good correlation between the EnChroma and Ishihara tests ($r=0.81$, $p<2.3X10^{-10}$), correlation between EnChroma and the FD15 was poor ($r=0.49$, $p<2.3X10^{-10}$). The qualitative analysis showed high trust and ease of use when scored by patients and clinicians.

Discussion The low correlation between the EnChroma and FD15 tests could be due to oversensitivity of the EnChroma test, however previous studies comparing the FD15 to other colour vision tests showed a low sensitivity for the FD15, (0.59)[1] suggesting that EnChroma results may be true abnormalities rather than false positives.

Apps like EnChroma have the potential to revolutionise, modernise and personalise colour vision testing in medicine, however the study lacks power (shown by the large confidence intervals) and will have to be repeated on a larger scale. Patients are keen to engage with m-health and more, suitable solutions should be explored. M-health has the potential to enable rapid point of care testing and fully remote management of side effects in TB and MDR-TB with further potential in other conditions.

REFERENCE

1. Marechal M, Delbarre M, Tesson J, Lacambre C, Lefebvre H, Froussart-Maille F. Color Vision Tests in Pilots' Medical Assessments. *Aerospace Medicine and Human Performance*. 2018;89(8):737–743. Available from doi:10.3357/AMHP.5009.2018 [Accessed May 4, 2021].

P31 CHARACTERISTICS ASSOCIATED WITH TREATMENT DECISIONS AND OUTCOMES IN NON-TUBERCULOUS MYCOBACTERIAL PULMONARY DISEASE: A RETROSPECTIVE COHORT STUDY

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10.1136/thorax-2021-BTSabstracts.141

Introduction Despite comprehensive guidelines the decision to treat non-tuberculous mycobacterial pulmonary disease (NTM-PD) is often determined by individual patient characteristics. The factors driving such decisions are reported infrequently in UK cohorts, and often exclude the immunosuppressed. Here we evaluate the features associated with treatment initiation in NTM-PD, and subsequent clinical outcomes.

Methods Positive non-tuberculous mycobacteria (NTM) samples from our hospital sites between 2011–13 and 2017–21 were analysed. Patients with respiratory isolates meeting the ATS/IDSA microbiological diagnostic criteria were included, and their digital hospital records examined. Multivariable logistic regression analyses were performed to examine characteristics significantly associated with treatment initiation and favourable clinical outcomes.

Results 125 patients were identified (table 1); 116 (93%) had abnormal imaging. 43 (34%) of the total cohort received specific antimicrobial therapy for NTM - 36% in 2011–13, compared to 31% in 2017–21 (p=0.6). Cavitatory change on imaging was the only variable significantly associated with commencing treatment (OR 9.57 [95% CI 2.30–39.70; p<0.01]). Patients who isolated *Mycobacterium avium* complex, *M. kansasii* or *M. xenopi* appeared more likely to receive treatment. Those aged ≥80 were significantly more likely to not improve with NTM treatment (OR 0.69 [95% CI 0.48–0.99; p=0.04]), though overall there was a positive trend toward clinical improvement in the treated cohort (OR 1.23 [95% CI 0.98–1.54; p=0.08]). Over a median follow-up of 16 months (IQR 5–36 months), 36 patients (29%) died: this was not associated with any independent variable.

Abstract P31 Table 1

Descriptive Statistics of Cohort (n=125)		
Median age (IQR)	68 (56–75)	
Sex	Female	70 (56%)
NTM species isolated	*Mycobacterium avium* complex (MAC)	78 (62.4%)
	M. kansasii	7 (5.6%)
	M. xenopi	4 (3.2%)
	Rapid-growing species	18 (14.4%)
	Other slow-growing species	8 (6.4%)
	Species undefined/mix	10 (8%)
Radiological changes at diagnosis	Nodular/bronchiectatic	61 (48.8%)
	Cavitating	28 (22.4%)
	Other	27 (21.6%)
	Normal/Unavailable	9 (7.2%)
Comorbidities	Immunosuppressed[i]	36 (29%)
	Known lung disease (e.g. bronchiectasis, COPD, fibrosis)	81 (64.8)
	Malignancy (ongoing)	16 (12.8%)
	GORD	12 (9.6%)
Received NTM antimicrobial therapy	Yes	43 (34.4%)
	No	82 (65.6%)
Death from any cause during follow-up	Yes	36 (28.8%)
	Of those who received NTM treatment	14 (32%)
	Of those who did not receive NTM treatment	22 (27%)

[i]Includes patients with HIV (n=10, with non-disseminated NTM disease), immunoglobulin deficiencies, active haematological malignancies, and significant doses of immunosuppressant medication.

Conclusions Presence of cavitation on CT at diagnosis was strongly associated with use of anti-NTM antimicrobials, confirming findings of a previous South Korean study.[1] The proportion of patients receiving NTM treatment was no different between our two time periods. Interestingly, systemic immunosuppression (pathological or iatrogenic) was not associated with either need to commence treatment or negative outcomes, but treatment was less likely to improve symptoms in those $\geq$80. A better understanding of who benefits from antimicrobial treatment for NTM-PD would aid patients and clinicians in making decisions about when to initiate therapy.

REFERENCE

1. Hwang JA, *et al*. Natural history of Mycobacterium avium complex lung disease in untreated patients with stable course. *Eur.Respir.J*. 2017 Mar 1;**49**(3).

P32 CUTANEOUS ADVERSE DRUG REACTIONS TO ANTI-TUBERCULOSIS THERAPY – AN ISSUE FOR FIXED-DOSE COMBINATION TREATMENTS?

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10.1136/thorax-2021-BTSabstracts.142

Introduction Fixed dose combination (FDC) tablets for first-line anti-TB treatment (ATT) enable simple prescribing of multiple drugs with reduced pill burden. Cutaneous adverse drug reactions (CADR), can occur to both the individual components and the excipient ingredients. We noted rapid-onset severe rash appearing with Voractiv (Rifampicin, Isoniazid, Pyrazinamide, Ethambutol FDC) in some patients - prompting an assessment of CADR with different ATT drug combinations.

Methods We conducted a retrospective review of TB disease cases commencing standard 4-drug therapy January 2016 to February 2021. Patients were categorised by regimen: Voractiv only; Rifater (Rifampicin, Isoniazid, Pyrazinamide FDC) plus Ethambutol (E); and Rifinah (Rifampicin, Isoniazid FDC) plus Pyrazinamide (Z) and Ethambutol. Records were examined for history of clinically-significant rash in the first month of treatment (that prompted either treatment interruption or use of adjunct medications). Data were analysed with Chi-square & Fisher's exact tests.

Results 378 patients were assessed. Median age was 39 years, 44.2% were female. Main ethnic groups were Black-African (24.6%), White (20.1%), and Indian (18.5%). Moderate or severe rash within 1 month occurred in 5.3% (table 1). There was no clear relationship between this and age, sex, ethnicity, past medical history, or HIV/TB coinfection. Although frequency of rash requiring intervention was similar across the three cohorts, more rapid-onset rashes (less than an hour after first dose) were seen with Voractiv ($p = 0.03$).

There was no standard approach to investigation of rash including eosinophil counts and liver function testing, impairing our ability to detect systemic events. 5 of 6 Voractiv, 6/8 Rifater+E, and 4/6 Rifinah+Z+E cases had treatment reintroduction, though in only 2 was this with the original FDC. In 11 of 15, a culprit drug was omitted: Pyrazinamide (in 5), Isoniazid (3), Rifampicin (2), Ethambutol (1). Four continued without interruption receiving oral antihistamines and occasionally topical steroids; one had no intervention documented.

Conclusion Despite convenience, our review suggests some FDCs may be associated with rapid-onset rash. Investigation of CADR was hampered by a lack of standardised management. If implemented, this would ensure consistency, plus early detection of systemic reactions and issues with specific drug batches.

Abstract P32 Table 1 Frequency of clinically significant rash within first month of treatment by ATT regimen, January 2016 to February 2021

ATT regimen	Patients *n*	Rash requiring intervention *n* (%)	Rapid onset (≤ 1 hour) *n* (% of rash)
Voractiv	110	6 (5.5)	4 (67)
Rifater+E	143	8 (5.6)	1 (12.5)
Rifinah+Z+E	125	6 (4.8)	0
Total	378	20 (5.3)	5 (25)

P33 A RETROSPECTIVE REVIEW OF THE INVESTIGATION INTO PATIENTS WITH POSITIVE CULTURES FOR NON-TUBERCULOUS MYCOBACTERIA (NTM). JUST HOW MUCH WORK IS IT?

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10.1136/thorax-2021-BTSabstracts.143

Introduction NTM patients are an increasing part of the workload of the mycobacterium service. Diagnosis can be challenging and often requires repeated samples, radiology and clinic attendances, all of which produces a significant workload on the multi-disciplinary team. In our hospital serving a population of ~270,000, this is done by the mycobacterium service, primarily set up to manage mycobacterium tuberculosis (MTB). We conducted a workload analysis for NTM in our service, with a view to assess and improve our performance.

Methods Data were collected retrospectively for all patients with a positive culture result for NTM between Nov 2017 and Dec 2020. For each patient, total number of samples sent, number of positive samples, radiology results, presence of symptoms, and whether they were assessed by the mycobacterium service were collected. Patients were then assessed against the British Thoracic Society (BTS) criteria for NTM disease.

Results Our centre received 358 positive cultures for NTM from 154 patients (81 (53%) male, 73 female; ages 3months to 91years with 3 under 18, median 55years). There were 1–14 positive cultures/patient (median 1) and 89 (58%) patients had only one positive culture. 15 different NTM were identified. 11 patients had 2 or more different NTM. 6 patients had NTM/MTB coinfected. M.avium complex accounted for 63 (38%) of the 168 patient unique isolates (M.avium 45, M. chimera 16, M.intracellulare 2), followed by M.abcessus/M. chelonae 24 (14%), M.fortuitum 19 (11%), M.kansasii 15 (8.9%), M.gordonae 10 (6%), 10 were not identified by whole genome sequencing. Almost all positive cultures were sputum, 7 bronchoalveolar lavage, 3 pus, 3 early morning urine, 1 blood culture. Patients with more than one culture had CT imaging. Most patients had comorbidities: 8 cystic fibrosis, 10 HIV. 31 patients were treated for NTM disease.

Conclusions Despite only a small number of patients meeting the criteria for NTM disease, each single positive NTM culture generates a cascade of further investigations and work for the mycobacterium service. As a minimum, multiple samples, radiology and symptom assessment are needed. For those NTM associated with more complex comorbid disease, this often needs to be repeated over many months.

P34 5-YEAR EXPERIENCE OF LATENT TUBERCULOSIS INFECTION (LTBI) MANAGEMENT PRE-IMMUNOMODULATORY THERAPY AT A TERTIARY HOSPITAL INFECTIOUS DISEASES UNIT IN THE UK

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10.1136/thorax-2021-BTSabstracts.144

A growing number of immunomodulatory therapies that can increase the risk of reactivating latent TB infection (LTBI) are being used. Accordingly a broader range of patients screened for LTBI and referred to TB clinics bring new challenges to chemoprophylaxis risk benefit assessment. We describe 5 years' experience of LTBI management in our infectious diseases TB clinic.

We collected retrospective case note data for all LTBI patients who were assessed for chemoprophylaxis in the clinic between 1/9/2015–30/9/2020. We recorded interferon gamma release assay (IGRA) and tuberculin skin test (TST) results, choice of LTBI chemoprophylaxis and completion rates, and alanine aminotransferase (ALT) levels during treatment. We compared these outcomes according to patient age and gender, referring specialty, current and planned immunomodulatory therapy.

367 patients (48% female) were diagnosed with LTBI, 188 (51%, 47% female) of whom were pre-immunomodulatory therapy and significantly older (median age 56.2 vs 32.6 $p<0.0001$). This group were also more likely to have had a negative/indeterminate QuantiFERON-TB Gold (QFT) (25.5% vs 4.1%, $p<0.0001$), as were the 95/188 of these on immunosuppressive therapy when QFT tested (41% vs 9%, $p<0.0001$). In total, 25 different immunomodulatory treatments were planned by 7 referring specialties for >20 different conditions; anti-TNF (87 patients, 46.3%), other biologic/small molecule inhibitors (SMI) (38, 20.2%), checkpoint inhibitors (21, 11.2%) and DMARDs (14, 7.4%). Oncology referrals and the range of different agents both increased over the period, while overall numbers were stable.

90/188 (48%) patients initiated chemoprophylaxis, 50 with isoniazid (H), 40 with rifampicin/isoniazid (RH). Those initiating chemoprophylaxis were significantly younger (median 48.7 vs 63.5 years old, $p<0.0001$). Patients with planned anti-TNF (49, 56%) were more likely to initiate chemoprophylaxis than for other biologic/SMI (15, 39%) or immune checkpoint inhibitor therapy (19, 6%). 16 (18%) patients had any rise in ALT, 5 (6%) >5 times the upper limit of normal. 67 (74%) completed chemoprophylaxis, 6 stopped early due to ALT rises. No differences in these outcomes were seen according to chemoprophylaxis agent, gender or age.

Fewer than half pre-immunotherapy LTBI patients commenced chemoprophylaxis, reflecting older age, QFT uncertainty and an increasing variety of biologics/SMIs.

P35 NECK NODE TB: PERSPECTIVE FROM THE RAPID ACCESS HEAD AND NECK CLINIC

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10.1136/thorax-2021-BTSabstracts.145

Background Lymph node TB is the commonest form of extra pulmonary TB and in particular, neck node TB (approximately 20% local data). The 'neck lump pathway' was interrogated to understand differential diagnosis with regards TB and other pathologies.

Aim To assess fine needle aspiration cytology (FNAC) in the Rapid Access Head and Neck Clinic (RAHNC) to facilitate patient assessment, next investigation and appropriate timely out-patient review.

Method A retrospective review of all referrals during the period 01/01/2019–01/12/2019 was undertaken to assess whether initial assessment with FNAC was sufficient to plan on-going management of active TB.

Results 203 neck lump referrals were reviewed in RAHNC (median time from referral 9 days, IQR 4–35) as their first 2 week wait appointment; median age 53 (IQR 35–65); male gender 111 (55%); non-Caucasian ethnicity 83 (41%).

All referrals had initial FNAC and 18 (9%) underwent a second (table 1). First FNAC was diagnostic in 76% of malignant neck lumps. Further histology for diagnosis of cancer and/or staging required in 28 (44%) and in all lymphoma patients. A significant number of benign conditions (27%) required surgical biopsy to exclude malignancy.

TB suspected in 17 (8%); median age 42 (IQR 31–51); non-Caucasian ethnicity 13 (76%); initial FNA consistent with TB cytology (7 granulomatous; 8 necrotising; 1 caseating inflammation; 1 pus). A single patient underwent a second FNA for TB culture. 5 (29%) required excision biopsy (3 confirmed TB; 2 lymphoma).

TB diagnosed in 14 (7%) with 64% culture positivity: 7 fully sensitive; 1 Isoniazid resistance; 1 Rifampicin mono-resistance; 3 culture negative; 2 culture not performed).

Median time from first attendance to TB treatment start 47 days (IQR 27–76). All persons started on TB therapy completed their intended regimen duration.

Conclusion The RAHNC effectively investigates neck lumps of varied pathologies. A single FNA may be sufficient to

Abstract P35 Table 1 Fine needle aspiration cytology (FNAC) result by diagnosis and requirement for further histological clarification

	Final diagnosis frequency (%)	1st FNAC diagnostic (%)		Further histological diagnosis required	Histology required for IHC/staging
Head and neck cancer	45 (22)	61 (76)	37 (82)	8	20
Metastatic cancer	16 (8)		12 (75)	4	2
Lymphoma	19 (9)		12 (63)	7	19 (100%)
TB	14 (7)	11(79)		3	NA
Benign other	109 (53)	73 (67)		29 (27%)	NA

Abbreviations used: **FNAC** fine needle aspiration cytology; **TB** tuberculosis; **IHC** immunohistochemistry

diagnose TB (79%). However, TB cytology is not specific and in particular, lymphoma cannot be excluded. However, despite early intervention with FNAC, there remains a relatively long duration before TB treatment is commenced.

P36 SCREENING FOR BLOOD-BORNE VIRUSES AND VITAMIN D DEFICIENCY IN PATIENTS WITH ACTIVE AND LATENT MYCOBACTERIUM TUBERCULOSIS (TB) INFECTION IN THE UK: A LONGITUDINAL COHORT STUDY

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10.1136/thorax-2021-BTSabstracts.146

Introduction Routine Human Immunodeficiency Virus (HIV) and viral hepatitis screening for newly diagnosed active and latent TB infection (LTBI) respectively are recommended by NICE, but there is sparse data relating to screening for Vitamin D (Vit D) deficiency in both active and LTBI infection in the UK however.

Aims The assessment of the screening rates and prevalence of HIV, viral hepatitis (B and C) and Vit D deficiency in adults with newly diagnosed active and LTBI.

Methods A longitudinal prospective study conducted over a five year period in a tertiary hospital in the North East of England. Data were obtained from a specific service database and examined ethnicity; blood-borne viral status; Vit D levels; liver and kidney function at diagnosis.

Results A total of 259 patients were diagnosed with TB during the study period (92 active; 167 latent). The main ethnic groups were Black African (34%), Caucasian (32%), and Indian Subcontinent (19%).

HIV testing was performed in 87 (95%) of patients with active TB, while 141 (84%) were tested in the LTBI group. Four patients and a single individual were newly diagnosed with HIV infection in the active and LTBI groups, respectively.

Viral Hepatitis serology was performed in 62% and 82% of patients with active and LTBI respectively. Seven patients were newly diagnosed with Hepatitis B infection in the LTBI group.

Vit D levels were performed at baseline in 107 (41%) patients with a median level of 33nmol/L. 37 (35%) individuals had levels below 25nmol/L. Vit D levels were significantly lower in the active TB group ($p=0.0004$).

Chronic liver and renal disease were diagnosed pre-treatment in 5% and 2% respectively.

Conclusions Screening for HIV and viral Hepatitis infection remained high for both groups during this period with a small but significant number of new diagnoses. Although Vit D deficiency remains contentious, the study provides evidence to support routine screening but larger longitudinal studies where cost-effectiveness is assessed are warranted.

P37 MANAGING NON TUBERCULOUS MYCOBACTERIAL PULMONARY DISEASE – MISSED OPPORTUNITIES?

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Introduction Non-tuberculous mycobacterium pulmonary disease (NTM-PD) can be a cause of significant pulmonary disease. Early diagnosis and treatment is important. In this review we studied the investigation, treatment and outcomes of patients who had microbiological confirmation of a non-tuberculous mycobacterium (NTM).

Methods A review of all patients from 2017 - 2019 with a single sputum or bronchial wash culture of NTM was undertaken with notes, microbiology and radiology review. Further analysis was done to review whether patients were managed according to the BTS guidelines.[1]

Results Data for 135 patients was analysed, epidemiological and clinico-radiological findings are shown in table 1. 30 patients were treated for NTM-PD. 21 met the criteria for treatment.

17/30 had repeat sputum cultures at the end of the treatment. 13/30 achieved showed sputum conversion. 12/30 of treated patients showed improved outcomes at treatment completion. 2 were unchanged; 4 died (unrelated to NTM). The remainder, 12/30, remain under follow up.

105/135 of patients with single sputum isolates for AAFB were not treated. 32/105 had evidence of NTM-PD. Reasons for not treating are as follows – 11/32 had mild symptoms only, 8/32 had other significant co-morbidities causing symptoms, 3/32 refused treatment, 3/32 reason unclear, 3/32 not

Abstract P37 Table 1 Clinical parameters of the patients with positive NTM culture

Clinical Parameter	NTM Patients 2017-2019
BMI	24.9 ± 6.0
Cough (%)	60.0
Dyspnoea (%)	57.4
Weight Loss (%)	39.3
Lethargy (%)	70.5
HIV +ve (%)	0.8
Smokers (%)	52.9
Chronic respiratory conditions (%)	Bronchiectasis 29.7
	COPD 25.0
	Asthma 23.4
	None 25.6
On immunosuppressants (%)	17.6
On inhaled antibiotics (%)	2.4
On ICS (%)	54.8
CXR Findings (%)	Consolidation 24.5
	Cavitation 4.7
	Normal 30.2
CT Findings (%)	Bronchiectasis 52.7
	Consolidation 20.0
	Cavitation 11.8
	Normal 10.9
Sputum culture 1 (%)	Mycobacterium intracellulare 14.5
	Mycobacterium avium 12.2
	Mycobacterium chimaera 15.3
	Negative 9.2
	Not done 21.4
BAL (%)	Mycobacterium intracellulare 8.5
	Mycobacterium avium 7.0
	Mycobacterium chimaera 12.4
	Negative 9.3
	Not done 51.2

Values given as mean ± SD (unless stated otherwise)

followed up, 4/32 died. Of the patients who met the criteria for treatment for NTM-PD, 7/32 had repeat sputum of which 4 had persistent sputum AAFB positivity.

72/105 patients were followed up. 57% were unchanged, 24% showed improvement 2% deteriorated and 6% died (Unrelated).

Conclusion This review of the NTM-PD patient cohort has demonstrated that a significant number of patients were over-treated, but also there were missed opportunities for patients with NTM-PD. Patients who are treated need to be managed more closely, aligned with sputum conversion and radiology to optimize outcomes. The need for a dedicated service for the management of NTM-PD and other host defence disease has been identified with clearly defined pathways to achieve the best clinical outcomes.

REFERENCE

1. Haworth CS, Banks J, Capstick T, et al. British Thoracic Society guidelines for the management of non-tuberculous mycobacterial pulmonary disease (NTM-PD) *Thorax* 2017;**72**:ii1–ii64.

P38 A RETROSPECTIVE REVIEW OF TREATMENT OUTCOMES, MORBIDITY AND MORTALITY IN PATIENTS TREATED FOR NON-TUBERCULOUS MYCOBACTERIAL (NTM) INFECTION

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10.1136/thorax-2021-BTSabstracts.148

Introduction NTM disease can be challenging to diagnose, requiring repeated samples, radiology and clinic attendances. Treatment requires prolonged administration of species-specific multidrug regimes, which can often themselves cause significant morbidity. The decision to treat can be difficult, often requiring longitudinal assessment, and certainly needs the patient to be on engaged. This retrospective review looked at patients treated for NTM disease in our service.

Methods Data were collected retrospectively for all patients treated for NTM disease between Nov 2017 and Dec 2020. Fulfilment of British Thoracic Society (BTS) criteria for NTM disease, NTM identity and patient co-morbidities were collected. Patient outcomes were assessed by treatment completion, length of treatment, side-effects experienced, and whether there was any relapse within one year of completing treatment.

Results 31 patients were treated for NTM disease. The median age was 59 (range 13–88 years), all patients had co-morbidities and all met the BTS criteria for NTM disease. Patients were treated for M.avium 13, M.chimera 2, M.abcessus 6, M. chelonae 1 and M.kansasii 9. 21 have completed treatment and 5 are still undergoing treatment. 2 had treatment stopped due to intolerance of medications and 1 stopped due to the failure to culture convert. 2 patients died while treatment was on-going. 12 patients experienced treatment-related side effects/complications necessitating either stepwise reintroduction or alteration of their regimen, 7 of which successfully recommenced treatment. To date, no one who is considered to have completed treatment has had a return of NTM disease.

Conclusions Treatment of NTM disease is long, with lots of potential drug side effects necessitating nursing support and monitoring. Furthermore patients are often older and certainly co-morbid. This is reflected in our data, where 40% of patients experience treatment-related side effects significant enough to lead to the alteration of treatment. Encouragingly however many were to recommence and complete treatment. Careful selection of those most likely to experience severe disease, evaluation of benefit versus risks of treatments, and patient engagement are paramount to treatment success.

P39 CAN ADVANCES IN MOLECULAR METHODS IMPROVE THE MANAGEMENT AND OUTCOMES OF NON-TUBERCULOUS MYCOBACTERIAL LUNG DISEASE (NTM-LD)? A SERVICE EVALUATION OF LABORATORY AND CLINICAL MANAGEMENT OF NTM-LD IN A LARGE TEACHING HOSPITAL IN ENGLAND

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10.1136/thorax-2021-BTSabstracts.149

NTM-LD is a rapidly evolving area, in terms of new drug treatments and the understanding of how in vitro sensitivities may correlate with treatment outcomes. This is underpinned by evolution of laboratory methods. LTHT have recently introduced in-house PCR to identify NTM to species level and rapidly subspeciate M. abscessus. Anecdotally there are varying management practices between clinicians despite BTS and IDSA guidelines. We carried out a retrospective service evaluation of all adults managed within the Leeds service without cystic fibrosis and with at least one sputum or BAL sample culture positive for clinically significant NTM from August 2016 to August 2020.

57 patients were included in the study, 43 MAC, of which 10 had fibrocavitatory changes on imaging. 43 were immunocompetent and 30 used inhaled steroids. 27 were treated, including 9 with fibrocavitary MAC, 12 with nodular-bronchiectatic MAC, 2 Xenopi, 1 malmoense, 1 M. abscessus (5 untreated), 1 interjectum and 1 of 2 Kansassii. There was a median delay of 103 days from positive culture result to sensitivity requesting and only 56% of treated patient's isolates were sent for sensitivity testing.

Two patients commenced NTM treatment immediately following the exclusion of MTB complex by direct Cepheid on sputum; unfortunately 2 smear positive patients inappropriately received TB treatment as Cepheid was not requested.

Only 11 patients completed the planned treatment duration; 12 patients stopped treatment earlier than planned including six who died. Two patients have relapsed.

Recent service improvements include weekly MDT, routine subspeciation of M. abscessus, direct Cepheid to allow empirical NTM treatment prior to culture results, in-house species identification and reporting comment to prompt clinicians to request sensitivities if treating.

We plan to re-evaluate following these changes to see if concordance with guidelines & outcomes have improved with these advancements in molecular testing combined with an MDT approach and hope ultimately to create a national collaboration to understand current management of NTM LD in UK.

P40 IS ROUTINE LIVER FUNCTION TESTING NECESSARY FOR PATIENTS RECEIVING LATENT TUBERCULOSIS TREATMENT?

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10.1136/thorax-2021-BTSabstracts.150

Introduction Tuberculosis was the leading cause of mortality from infectious disease until the covid-19 pandemic. Over a quarter of the world's population is estimated to have latent tuberculosis infection (LTBI), with 5–10% expected to develop active TB. Hepatotoxicity is a well described side-effect of anti-tuberculosis medication, often leading to disruptions in treatment. Currently, NICE guidelines recommend careful liver function test (LFT) monitoring of patients on anti-tuberculosis medication with liver disease, abnormal baseline LFTs or with history of alcohol or hepatotoxic drug misuse. However, there is no specific guidance on LFT monitoring for routine treatment.

Methods All patients with LTBI in a single centre were identified from hospital records over a 3-year period (January 2018-December 2020). Clinical notes and blood test results were analysed for all patients, identifying any drug induced liver injury (DILI). Frequency and timing of LFT monitoring once starting treatment was reviewed and correlated with patient symptoms.

Results Over a 3-year period, 180 patients received treatment for LTBI. 169 patients (94%) had baseline LFTs measured. 7 patients (3.9%) had deranged LFTs during their treatment, with 3 (1.7%) meeting the criteria for DILI. 2 of the 3 patients (66%) with DILI were symptomatic prompting blood tests, 1 patient (33%) had abnormal baseline LFTs. Of the 7 patients with LFT derangement during treatment, 4 (57%) had deranged baseline LFTs, 4 (57%) were symptomatic. Only 1 patient had neither symptoms nor abnormal baseline LFTs, but had abnormal baseline renal function requiring regular monitoring.

Conclusions These results suggest that risk of DILI is present but relatively low in patients receiving treatment for LTBI. Most patients from this cohort with DILI were either high risk as per NICE guidance or symptomatic prompting LFT checking. Therefore, routine monitoring of LFTs for all patients on LTBI treatment is unlikely to be cost-effective or change treatment outcomes. Instead, LFT monitoring should be considered specifically for patients that are high risk or with symptoms of DILI.

REFERENCES

1. National Institute for Health and Care Excellence (NICE) (2016) Tuberculosis. Available at https://www.nice.org.uk/guidance/ng33
2. Global tuberculosis report 2020. Geneva: World Health Organization; 2020. Licence: CC BY-NC-SA 3.0 IGO.

P41 PSEUDOMONAS AERUGINOSA: BURDEN, TREATMENT AND OUTCOMES IN A LONG TERM VENTILATION SERVICE

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10.1136/thorax-2021-BTSabstracts.151

Introduction Pseudomonas aeruginosa (PA) is a significant respiratory pathogen but is not well described in patients requiring long term ventilation (LTV). Whilst national guidance exists for the management of PA in the bronchiectasis population, standards for sputum surveillance and the use of nebulised antibiotics (NA) or long term macrolides (LTM) in the LTV population have not been established.

Our aim was to record the rate of PA and describe its treatment, in a large cohort of LTV patients.

Methods Retrospective cohort study using the regional LTV service database to identify patients. Electronic patient records were analysed for LTV indication and treatment with NA and LTM, and cross-referenced with regional microbiology datasets: specifically, positive results for Pseudomonas, Serratia, Proteus and/or Burkholderia spp.

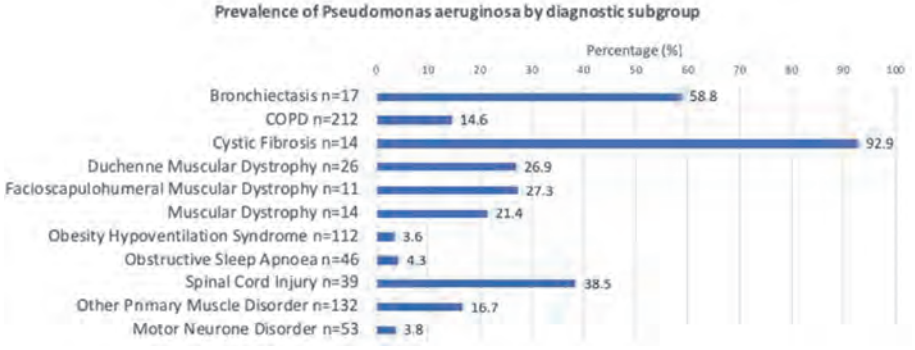
Results We identified 837 patients under the regional LTV service. 52/837 (6.2%) were ventilated via tracheostomy. 57/837 (6.8%) used a cough assist device alone and the remainder used non-invasive ventilation.

Figure 1 shows prevalence of PA by diagnostic subgroup; the burden of PA in bronchiectasis and CF was high as expected, however there was also a high burden of disease in patients with spinal cord injuries and primary muscle disorders, such as Duchenne Muscular Dystrophy.

Of the PA positive cohort, 45/146 (30.8%) were treated with NA: colistin (64.4%), an alternative NA (11.1%) or a combination (24.4%). 49.2% were taking long term macrolides: alone (56.2%) or combined with NA (43.7%).

Commencement of NA was poorly documented, hindering assessment of PA suppression or effects on emerging pathogens. Proteus/Serratia/Burkholderia spp. were isolated in 5.1% of the LTV cohort, of which 38% were co-colonising patients with PA.

Conclusions PA is common and seen across a diverse number of LTV indications, including neuromuscular conditions not traditionally associated with high bacterial load. PA prevalence was higher in tracheostomy patients. Many patients are treated with NA but the recording of eradication rates and sputum surveillance is low. The rate of 3 sentinel emergent pathogens was low but this may reflect the low rate of sputum



Abstract P41 Figure 1 Prevalence of pseudomonas aeruginosa by diagnostic subgroup

surveillance. This study highlights a need for further studies and development of guidance on pseudomonas in patients on LTV.

Diagnostics and monitoring of asthma and co-morbidities

P42 ASTHMA TREATMENT ADHERENCE CHECKS: PRESENT AND FUTURE

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10.1136/thorax-2021-BTSabstracts.152

Introduction In spite of its importance in optimising clinical outcomes and determining whether an escalation in therapy is indicated (e.g. initiating a biologic agent), the difficulty in identifying suboptimal adherence to asthma therapy persists. The most common method used to measure adherence by pharmacists in hospital asthma centres is the prescription refill check (PRC), but it is both flawed (e.g. assumption made that therapy collected has been appropriately administered) and can be time consuming to collect and interpret. This may therefore make it a barrier to effective and timely asthma management. The aim of this retrospective study was to quantify the time taken to complete a PRC from primary care using data retrieved from shared local care records (LCR) versus those obtained by contacting general practice (GP) directly, and the additional time taken when there was a need to obtain hospital prescription data.

Methods Data were scrutinised for patients for whom a PRC was conducted between August 2019 and May 2021 to ascertain the time interval taken between identification of the need for the PRC and its availability on the patient's electronic record.

Results Data for 885 patients were scrutinised and are illustrated in table 1.

A PRC using direct data extraction from a LCR took on average less than 2 days to complete. In contrast, there was an eleven fold increase in the time taken to complete a PRC when GP's had to be contacted. Retrieval of data from another hospital also added a delay to availability of prescription data.

Conclusions Given the frequency of sub-optimal adherence and its impact, access to robust and complete data needs to be efficient. The stark disparity amongst sources suggests that while the utility of electronic monitoring of therapy is established, appropriate direct access to prescription data is essential. This would then streamline the process by reducing demand on healthcare professionals to provide the data, would minimise delays in treatment escalation decisions, and the significant decrease in hospital pharmacy resource needed to obtain this data would allow pharmacist's time to be better spent improving non-adherence rather than detecting it.

Abstract P42 Table 1 Time interval for availability of prescription data by data source

Source (number of patients)	Mean interval in days between PRC request and data availability (Std Dev)	Range (days)
GP (n=445)	14.7 (21.1)	0–182
GP + Hospital (n=37)	14.0 (12.2)	0–64
LCR (n=340)	1.3 (3.2)	0–44
LCR + Hospital (n=63)	6.1 (5.6)	0–34

P43 EXPERIENCES OF ASTHMA IN THE UK-RESIDENT ADULT SOUTH ASIAN POPULATION: A QUALITATIVE STUDY

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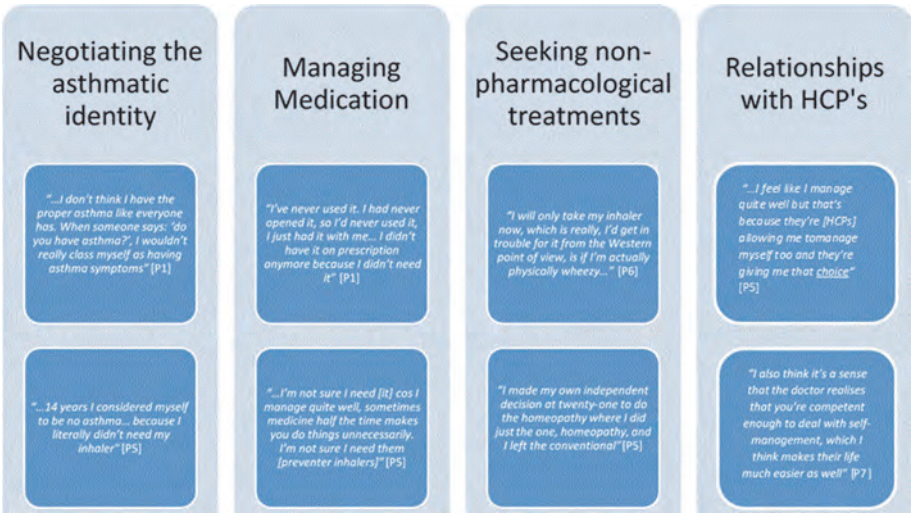
10.1136/thorax-2021-BTSabstracts.153

Introduction and Objectives South Asian individuals living with asthma in the UK are more likely to experience excess morbidity and increased hospitalisation rates than any other ethnic group. Prevention is an integral part of self- management (Pinnock, 2015). Failure to adhere to prescribed regimens is common amongst this population. This study investigated people's experiences with asthma, including medication adherence, the use of non-pharmacological treatment approaches, and the healthcare professional (HCP)-patient relationship in asthma healthcare.

Methods Using a qualitative approach, fourteen adults (12 female, 2 male, aged between 18–50) who identified as South Asian with a diagnosis of asthma (at least step 2 of the BTS guidelines) took part in semi-structured interviews. Interpretative phenomenological analysis (IPA) was used, informed by a symbolic interactionist (SI) perspective; a micro level theoretical framework which suggests that society is shaped and upheld by social interaction and explores how people make sense of their social world (Carter & Fuller, 2015).

Results Four themes were developed, focusing on how the asthmatic identity is negotiated, managing medications, seeking non-pharmacological treatments, and the HCP-patient relationship (see figure 1). Despite suffering acute exacerbations, participants questioned whether they identified as asthmatic, which impacted their decision to use preventative medication. Cultural identity was linked to traditional treatments and medication adherence. Characteristics of developing a therapeutic relationship with HCPs were described, including patient involvement and mutual respect. This involved having open discussions on the use non-pharmacological treatments which were linked to participants' cultural identity, illustrating the HCP's desire to be culturally responsive.

Conclusions HCP's should consider an explorative approach to consultation, to develop a culturally aware, therapeutic relationship and consider negotiation in prescribing. This could enhance the patients' ability to self-manage, and reduce resistance to advice and guidance from HCPs. Cultural identity is an important aspect of treatment and should be discussed to



Abstract P43 Figure 1

develop mutual care objectives between HCP and patient, to establish a therapeutic relationship.

P44 THE IMPACT OF LACK OF PROFICIENCY IN ENGLISH ON ASTHMA CONTROL

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Introduction Health inequalities play a role in poor clinical outcomes for people living with asthma. The UK Severe Asthma Registry has noted this in the differences in disease between Caucasian and Non-Caucasian groups when it comes to accessing severe asthma services and biologics prescribing. Whilst it is acknowledged that there is a difference in disease in terms of possible endo types between these groups, it is also acknowledged that there are cultural and language barriers. The aim of this study is to investigate if there is a correlation between poor asthma control and lack of proficiency in English.

Method Indicators of poor asthma control are the use of oral corticosteroids (OCS) and the over use of short-acting bronchodilators (SABA). The AstraZeneca Respiratory Outcomes Heatmaps tool was used to identify areas with both poor Asthma management (defined as >6 SABA and >3 OCS prescriptions in 2019/20), and compared this with the corresponding ONS Datashine census data for proficiency in English in our local area. A lack of proficiency was defined as those who did not speak English as a first language, and don't speak English well. Statistical analysis was undertaken using non-parametric Spearman's Rho correlation, SPSS version 26.

Results We identified 13,562 patients on the asthma register from 27 local GP surgeries. We found no correlation between excess OCS prescribing and lack of English proficiency - Rho =0.202, p = 0.312, but there was a significant correlation between lack of English proficiency and >6 SABA inhalers per year - Rho = 0.551, p = 0.003 (significance at 0.05).

Discussion Inequalities are complex and amongst professionals there is a lack of understanding due to a lack of data. We have identified a correlation between a marker of poor asthma control, and a lack of proficiency in English. The findings from this study will be used to target interventions in the areas identified as hot spots on the heatmaps. Development of multilingual, multimedia resources for those with poor literacy, and those who do not have good English language skills will be invaluable, as so little currently exists.

Please refer to page A191 for declarations of interest related to this abstract.

P45 ASSOCIATIONS BETWEEN EMPLOYMENT AND SOCIO-DEMOGRAPHIC AND HEALTH-RELATED FACTORS, IN PATIENTS WITH SEVERE ASTHMA

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10.1136/thorax-2021-BTSabstracts.155

Introduction Poorly-controlled asthma is associated with work absenteeism and loss of productivity. Less than 5% of asthma is stratified as 'severe asthma', which requires high-intensity multi-disciplinary care and is often associated with poor symptom control. Data regarding impact of severe asthma on workability is sparse; cross-sectional studies outside the UK have shown associations with disease severity, and poor physical and mental health status.[1,2] We aimed to identify socio-demographic and health-related associations with employment in these patients.

Methods We interrogated the Birmingham Regional Severe Asthma Service (BRSAS) Dendrite clinical registry (n=1453 patient records, 2004–21), and extracted baseline data on patients aged 16–64 years, and not in full-time education; variables comprised employment status, socio-demographics (age, gender, ethnicity, index of multiple deprivation (IMD), smoking status), general health (BMI, hospital anxiety and depression (HAD) scale, co-morbidities, atopy), and disease-related factors (pre-bronchodilator FEV_1, asthma control, quality of life, maintenance corticosteroids, eosinophil count, hospital admissions and rescue treatments). We used hypothesis testing and logistic regression to examine the relationship between these independent variables and employment.

Abstract P45 Table 1 Summary of explanatory variables, with hypothesis testing and crude (unadjusted) odds ratios by logistic regression

		Employed (n=548; 53%)[1]	Not employed (n=494; 47%)[1]	*Hypothesis testing*	*Unadjusted ORs (95% CI) reference category=not employed*
Age	Median (IQR)	44 (33–52)	45 (37–53)	*p=0.03*	*0.98 (0.97-1.00); p=0.01*
Female gender	Number (%)	367 (67)	383 (78)	*p<0.001*	*0.59 (0.45-0.78); p<0.001*
Ethnicity Caucasian	Number (%)	453 (84)	383 (79)	*p=0.03*	*1.43 (1.04-1.96); p=0.03*
IMD decile (ordinal)	Median (IQR)	5 (2–7)	3 (1–6)	*p<0.001*	*1.19 (1.14-1.24); p<0.001 (per unit increase)*
Current smokers	Number (%)	27 (5)	54 (11)	*p<0.001*	*0.42 (0.26-0.68); p<0.001*
BMI	Median (IQR)	30 (25–35)	33 (28–38)	*p<0.001*	*0.96 (0.94-0.97); p<0.001*
BMI <25	Number (%)	117 (23)	60 (13)	*p<0.001*	*2.03 (1.44-2.85); p<0.001*
Non-asthma related major co-morbidities[2]	Number (%)	204 (37)	314 (64)	*p<0.001*	*0.34 (0.26-0.44); p<0.001*
HAD anxiety score (0–21)	Median (IQR)	7 (4–11)	11 (7–15)	*p<0.001*	*0.89 (0.86-0.91); p<0.001*
Abnormal HAD anxiety score (11–21)	Number (%)	113 (26)	187 (52)	*p<0.001*	*0.32 (024-0.43); p<0.001*
HAD depression score (0–21)	Median (IQR)	6 (4–9)	10 (7–13)	*p<0.001*	*0.83 (0.80-0.86); p<0.001*
Abnormal HAD depression score (11–21)	Number (%)	80 (18)	171 (48)	*p<0.001*	*0.25 (0.18-0.34); p<0.001*
ACQ7 total score (0–6) (ordinal)	Median (IQR)	3.0 (2.1–3.7)	4 (3.2–4.7)	*p<0.001*	*0.52 (0.45-0.59); p<0.001*
Adequate control (ACQ7 score=0–1)	Number (%)	26 (7)	6 (2)	*p<0.001*	*4.12 (1.68-10.14); p=0.002*
AQLQ total score (0=worse, 7=better) (ordinal)	Median (IQR)	3.9 (3.0–4.8)	2.9 (2.2–3.6)	*p<0.001*	*1.84 (1.61-2.10); p<0.001*
Pre-bronchodilator spirometry (% predicted FEV_1)	Median (IQR)	80 (58–96)	70 (51–86)	*p<0.001*	*1.01 (1.00-1.02); p<0.001*
Maintenance oral corticosteroids	Number (%)	178 (34)	199 (42)	*p=0.007*	*0.70 (0.54-0.91); p=0.007*
Hospital admissions last 12 months	Median (IQR)	0 (0–2)	0 (0–3)	*p<0.001*	*0.93 (0.89-0.97); p<0.001*
Exacerbations requiring rescue oral corticosteroids last 12 months	Median (IQR)	5 (2–8)	6 (3–10)	*p=0.006*	*0.97 (0.95-1.00); p=0.05*

[1]data missing for n=204. [2]Includes pre-existing diagnosed anxiety, depression and psychosis. Hypothesis testing undertaken using chi-squared tests (categorical data), Mann-Whitney U-tests (non-parametric continuous data), tau-B (ordinal data). For continuous data, linear assumptions were tested using the Box-Tidwell transformation, prior to univariate logistic regression.

Results Data from 1246 patients were included; median age=44 (IQR=34–52), females=917 (74%), Caucasian ethnicity=1000 (80%), current smokers=97 (8%), median IMD decile=4 (2–7), median BMI=31 (26–35), 1 or more comorbidity=572 (46%), median%predicted FEV_1=74 (54–91). Univariate analyses of independent variables grouped by employment status (n=548 employed; 53%) are shown in the Table; there were no significant associations by disease phenotype (atopy, eosinophilic, non-eosinophilic). Multivariate binary logistic regression showed significant positive associations for IMD decile (OR=1.2, 95%CI=1.1–1.3) and AQLQ score (OR=1.5, 95%CI=1.2–1.9 per digit increase) with employment. Significant negative predictors were female gender (OR=0.5, 95%CI=0.3–0.8), major non-asthma related comorbidity (OR=0.5, 95%CI=0.3–0.7), maintenance oral corticosteroids (OR=0.5, 95%CI=0.3–0.8), and elevated HAD depression score (OR=0.5, 95%CI=0.3–0.8). The model was an adequate fit, explained 34% of the variance in employment (pseudo R^2) and correctly classified 70% of cases.

Conclusion When socio-demographic factors are taken into account, asthma-related quality of life, absence of major comorbidity, low treatment burden, and good mental health are associated with employment. However, these may not fully explain workability, and other hitherto unidentified cultural factors should be explored.

REFERENCES

1. Eisner MD, *et al*. *Am J Med*. 2006;**119**:884–91.
2. Ong ASE, *et al*. *J Asthma*. 2020;**24**:1–10.

P46 DOES ASTHMA DURING PREGNANCY ACTUALLY FOLLOW THE 'ONE-THIRD' RULE?

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Introduction Traditionally, asthma in pregnancy is thought to follow a 'one-third rule' which states in patients with diagnosed asthma, during pregnancy one-third will see worsening symptoms, one-third will enjoy improved control, whilst one-third will experience no changes to their asthma symptoms.[1]

We set out to test this theory using retrospective data analysis of data collected from a specialist obstetric asthma clinic.

Methods We carried out retrospective analysis of data collected from an obstetric asthma clinic over one year from October 2018 to October 2019 to assess whether patient's symptoms were better, unchanged or worse during their pregnancy. Data was reviewed from patients who were in at least their second pregnancy to allow for comparison between the current pregnancy and their earlier pregnancies.

Both subjective and objective symptom control was considered. Subjective control was determined by the patient's impression of their symptom burden, whilst objective control was determined by the number of steroid courses prescribed and the number of hospital admissions.

Results 48 patients were reviewed in the specialist obstetric asthma clinic, 28 of whom were in at least their second

Abstract P46 Table 1 Objective and subjective severity of asthma during pregnancy

Subjective control (compared to previous pregnancies)	Percentage of patients	No of steroid courses	Average number of steroid courses per patient	Number of admissions	Average number of admissions per patient
Better	18% (n=5)	1	0.2	1	0.2
Same	43% (n=12)	7	0.58	3	0.25
Worse	39% (n=11)	11	1	3	0.27

pregnancy. Of these patients, when compared to their previous pregnancies 18% reported better symptom control, 43% reported that their asthma remained unchanged and 39% reported worsening control.

Objective data on severity followed this pattern also. The mean number of steroid courses prescribed per patient was 0.2 in those who reported better control, 0.58 in those who reported no change to control, and 1 in those reporting worsening symptoms. Similarly, the number of average number of admissions per patient increased in accordance with subjective severity.

Conclusions Our analysis confirms that asthma control in pregnancy does not follow the simple one-third rule as previously speculated. When using subjective and objective measurements, a greater proportion of patients experienced either worsening asthma control or no changes to control during pregnancy, with only a small percentage reporting that their asthma improved.

REFERENCE

1. Schatz M, *et al*. The course of asthma during pregnancy, post-partum, and with successive pregnancies: a prospective analysis. *Journal of Allergy and Clinical Immunology*. 1988;**81**:509–51.

P47 A PILOT STUDY FOR AN ASTHMA IN PREGNANCY SERVICE WITHIN A UK TERTIARY CENTRE

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Background Suboptimal asthma control has implications for maternal and neonatal health, preterm labour and instrumental birth. An *Asthma in Pregnancy Clinic* was initiated to support our tertiary obstetric centre, to assess maternal asthma demographics and record foetal outcomes with a view to further development of an Asthma in Pregnancy Service.

Method A retrospective analysis was performed for patients referred to clinic between July 2018 and February 2021. Data were collated for population demographics, asthma severity, treatment optimisation and foetal outcome. Birth weight and delivery method were used as crude measures of foetal outcome.

Results 99 consecutive referrals to the clinic were reviewed (mean age 30±5.9 years, Caucasian ethnicity 64%; 11% smoking prevalence). At baseline, 52% had moderate asthma as graded by the asthma severity/treatment guidelines[1]; 72% were taking inhaled corticosteroids; 24% had raised serum eosinophils (>0.34 x10^9/L); only 5% had FeNO >50 parts per billion (ppb) at presentation.

10% required no change to their existing asthma treatment regimen once adherence was optimised. 62% had inhaled therapies escalated and 17% required oral prednisolone during their pregnancy.

55% had significant reflux symptoms. In a subgroup analysis, there was statistically significant improvement in asthma control as per GINA following reflux treatment optimisation; 2.38(1.5) to 2.21(1.4), p<0.001.

83% of patients had full term births with a mean foetal weight 3205(589) grams. Foetal birth weight and delivery method were not significantly related to oral or inhaled corticosteroid use.

Conclusion This pilot demonstrates that an Asthma in Pregnancy Clinic in a tertiary centre is both feasible and efficacious with a significant proportion requiring asthma treatment optimisation. However, simple measures (education, enhancing therapy compliance) remains essential. Optimisation of anti-reflux treatment significantly improved GINA scores, highlighting the importance of adequate reflux management in pregnant asthmatics.

The Asthma in Pregnancy Clinic is the first step in developing a dedicated multi-disciplinary service to support pregnant asthmatics. This pilot has highlighted the importance of standardised paperwork and rigorous data collection to provide up-to-date and locally relevant improvements in clinical outcomes.

Abstract P47 Table 1 Demographics of study cohort

Demographics (n=99)	Result (mean±SD)
Age (years)	30.3(±5.9)
Ethnicity	64% Caucasian, 35% BAME
Stage of pregnancy at referral	1st trimester 26%; 2nd trimester 64%; 3rd trimester 9%
FEV_1 (L)	2.48(±0.47)
Serum eosinophil count (x10^9/L)	0.31(±0.12) n=24 (24%) n=8 (8%)
Eosinophil count >0.34	
Eosinophil count ≥0.6	
FeNO (ppb) (median/IQR)	21(11–30) n=5 (5%)
FeNO> 50 ppb	
Foetal birth weight (BW) (g)	3205(±589)
Local average birthweight (BW) (g)	3247
Delivery method	18% instrumental, 38% CS
Local annual CS rate	35.1%

Abbreviations used:
BAME Black Asian and Minority Ethnic; *FEV_1* forced expiratory Volume in one second; *FeNO* fractional exhaled nitric oxide; *CS* caesarean section

REFERENCE

1. https://www.sign.ac.uk/sign-158-british-guideline-on-the-management-of-asthma SIGN 158, July 2019. Accessed 06/06/2021.

P48 LONG-TERM EFFICACY OF DUPILUMAB IN PATIENTS WITH MODERATE-TO-SEVERE ASTHMA IN THE LIBERTY ASTHMA TRAVERSE OPEN-LABEL EXTENSION STUDY: IMPROVEMENTS IN ASTHMA CONTROL AND HEALTH-RELATED QUALITY OF LIFE

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Introduction and Objectives For asthma patients, achieving asthma control and improving health-related quality of life (HRQoL) are important long-term management goals. Dupilumab is a monoclonal antibody targeting interleukin-4 and interleukin-13, key and central drivers of type 2 inflammation

in multiple diseases. Here, we report effects of long-term dupilumab treatment on asthma control and HRQoL outcomes from the TRAVERSE open-label extension (OLE) study (NCT02134028) in patients with moderate-to-severe asthma who had previously completed a dupilumab asthma study (phase 2b (P2b) or phase 3 QUEST).

Methods During TRAVERSE, patients received add on dupilumab 300 mg every 2 weeks. Asthma control (5-item Asthma Control Questionnaire, ACQ-5; range 0–6, lower scores indicate better control) and HRQoL (Asthma Quality of Life Questionnaire - standardized, AQLQ(S); range 1–7, higher scores indicate improved asthma-specific quality of life) were assessed at TRAVERSE Week 0, 24, and 48. The overall intention-to-treat population and the type 2 asthma population, defined as patients with blood eosinophils ≥150 cells/μL or FeNO ≥25 ppb at parent study baseline (PSBL), were evaluated.

Abstract P48 Table 1 Asthma control and AQLQ scores during the TRAVERSE OLE study in the overall population

Outcome	Patients from P2b[a]		Patients from QUEST[b]	
	Placebo/ Dupilumab	Dupilumab/ Dupilumab	Placebo/ Dupilumab	Dupilumab/ Dupilumab
Asthma control (ACQ-5 scores)	n = 111	n = 421	n = 517	n = 1,013
PSBL, mean (SD)	2.63 (0.77)	2.74 (0.80)	2.73 (0.74)	2.76 (0.79)
Change from PSBL at Week 0 of OLE, mean (SD)	−1.01 (1.01)	−1.05 (1.08)	−1.22 (1.04)	−1.54 (1.08)
Change from PSBL at Week 24 of OLE, mean (SD)	–1.37 (0.91)	–1.48 (1.10)	–1.61 (1.08)	–1.68 (1.05)
Change from PSBL at Week 48 of OLE, mean (SD)	−1.33 (1.07)	−1.57 (1.11)	−1.64 (1.08)	−1.69 (1.08)
Responder[c] analysis				
Week 0 of OLE,	n = 111	n = 421	n = 507	n = 980
n (%)	79 (71.2)	284 (67.5)	390 (76.9)	818 (83.5)
Week 24 of OLE,	n = 110	n = 421	n = 513	n = 1005
n (%)	91 (82.7)	340 (80.8)	431 (84.0)	869 (86.5)
Week 48 of OLE,	n = 105	n = 400	n = 488	n = 957
n (%)	83 (79.0)	329 (82.3)	418 (85.7)	830 (86.7)
HRQoL (AQLQ(S) scores)	n = 109	n = 418	n = 502	n = 960
PSBL, mean (SD)	4.27 (1.12)	3.98 (1.10)	4.25 (1.01)	4.29 (1.08)
Change from PSBL at Week 0 of OLE, mean (SD)	0.68 (0.91)	0.80 (1.08)	1.07 (1.11)	1.33 (1.16)
Change from PSBL at Week 24 of OLE, mean (SD)	1.07 (0.99)	1.28 (1.24)	1.38 (1.15)	1.38 (1.16)
Change from PSBL at Week 48 of OLE, mean (SD)	1.07 (1.13)	1.40 (1.19)	1.39 (1.17)	1.40 (1.18)
Responder[c] analysis				
Week 0 of OLE,	n = 97	n = 372	n = 494	n = 939
n (%)	49 (50.5)	221 (59.4)	340 (68.8)	716 (76.3)
Week 24 of OLE,	n = 108	n = 413	n = 495	n = 948
n (%)	73 (67.6)	304 (73.6)	384 (77.6)	732 (77.2)
Week 48 of OLE,	n = 103	n = 397	n = 473	n = 908
n (%)	67 (65.0)	303 (76.3)	366 (77.4)	712 (78.4)

[a]Study duration of P2b study: 24 weeks. [b]Study duration of phase 3 QUEST study: 52 weeks. [c]Responders are defined as patients with ≥0.5 improvement from PSBL in ACQ-5 or AQLQ global score. Patients with <0.5 improvement from PSBL in ACQ-5 or AQLQ(S) global score at the time point are considered as non-responders. For the patients from dupilumab arms of P2b, there was a gap (≥16 weeks) between the last dose in P2b and the first dose in OLE, because the patients needed to complete the 16-week follow-up of P2b to enroll in OLE. DPL, dupilumab; PBO, placebo; SD, standard deviation.

Results 2,062 patients from QUEST (n=1,530; 517 PBO/DPL and 1,013 DPL/DPL patients) and P2b (n=532; 111 PBO/DPL and 421 DPL/DPL patients) rolled over into TRAVERSE. Mean (SD) ACQ-5 scores improved from PSBL at OLE Week 0, Week 24, and Week 48 in dupilumab/dupilumab and placebo/dupilumab groups from both QUEST and P2b studies. ACQ-5 scores exceeded the clinically meaningful response threshold (≥ 0.5 reduction) in 79–87% of patients (table 1). Mean (SD) AQLQ(S) scores improved from PSBL at OLE Week 0, Week 24, and Week 48; 65–78% of all patients showed clinically meaningful improvements (≥ 0.5 increase) (Table). In general, the largest mean improvements and percentage of patients with a clinically meaningful response was seen in the patient group who had received dupilumab in the parent study. Improvements were comparable in patients with a type 2 phenotype. The dupilumab safety profile during TRAVERSE was similar to that observed in the parent study populations.

Conclusions In line with patient-reported outcomes observed in P2b and QUEST, dupilumab-treated patients with moderate-to-severe asthma demonstrated clinically meaningful and sustained improvements in asthma control and HRQoL during the TRAVERSE OLE study.

Please refer to page A191 for declarations of interest related to this abstract.

P49 BONE PROTECTION FOR PATIENTS WITH ASTHMA – A SERVICE EVALUATION

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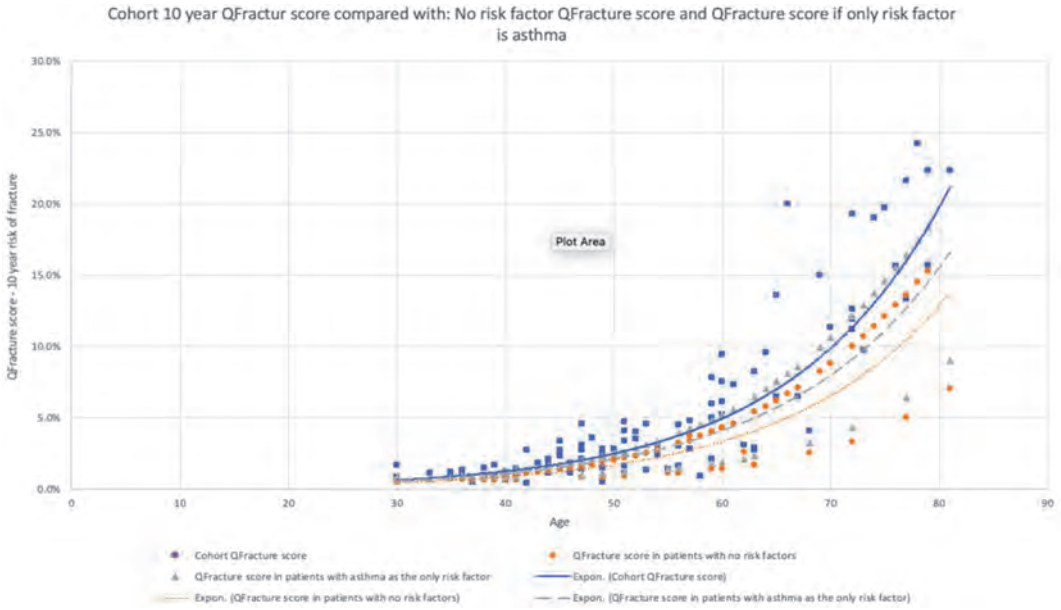
Background Asthma and osteoporosis guidelines recommend that patients on high-dose oral steroids (OS) should be considered for bone protection. Patients on low-dose OS, or inhaled corticosteroid (ICS) of any dose, should have their fracture and osteoporosis risk evaluated. The Scottish Intercollegiate Guidelines Network recommend the online risk-calculator QFracture. However, ICS use is not taken into account by any risk-calculator, despite recent evidence that ICS use has systemic effects on bone health.[1]Patients with a clinically significant 10-year risk of fracture qualify for a Dual-energy X-ray absorptiometry scan (DEXA). No threshold for DEXA referral is identified by the guidelines, though it is suggested to be around 10%. No fracture or osteoporosis screening is undertaken at the tertiary asthma clinic where this project was conducted.

Methods A cross-sectional study was conducted using data from 129 patients between January to March 2021 at a tertiary asthma clinic. The QFracture calculator was used to identify fracture and osteoporosis risk factors. A 10-year risk score was calculated.

Results Over 58% of the cohort had at least two risk factors. 10% of the sample were prescribed frequent OS. 13.2% had a 10-year risk score of 10% or greater. Qfracture risk increases with age, however this association was more marked in the cohort population, even when asthma as a risk factor was taken into account (figure 1). Notably, 50% of the sample were prescribed high-dose ICS. 6 patients had a diagnosis of osteoporosis, of whom only half were prescribed bisphosphonates.

Discussion The fracture risk of patients of this tertiary asthma clinic is underestimated and undertreated. A



Abstract P49 Figure 1 Graph showing average QFracture scores for patients within the cohort, plotted against: QFracture scores with no risk factors and asthma as only risk factor

significant proportion of patients are treated with high-dose ICS; further research is required to evaluate the effect of ICS use on bone health. If this is found to be significant, it should be incorporated in future risk calculators. Until then, a high-suspicion clinical approach for osteoporosis development in patients with severe asthma should be adopted in primary and tertiary care.

REFERENCE

1. Chalitsios C V, Shaw DE, McKeever TM. Risk of osteoporosis and fragility fractures in asthma due to oral and inhaled corticosteroids: two population-based nested case-control studies. *Thorax*. 2021;**76**(1):21–8.

P50 USE OF ACCELEROMETERS TO COMPARE PHYSICAL ACTIVITY LEVELS IN PARTICIPANTS WITH ASTHMA GROUPED BY BODY MASS INDEX AND ASTHMA SEVERITY

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Background Patients with asthma may find it impacts their ability to be physically active. Physical activity (PA) has been demonstrated to be lower in asthmatics compared to healthy controls. Obesity is commonly linked with difficult-to-control asthma and can worsen outcomes. At least 150 minutes of moderate physical activity (PA) per week is recommended for all adults by the World Health Organisation. We aimed to compare PA levels in patients with difficult-to-control asthma and body mass index (BMI) $\geq$25 kg/m^2 (DOW group) and two control groups with mild-moderate asthma, one with BMI <25 kg/m^2 (MHW group) and one with BMI $\geq$25 kg/m^2 (MOW group).

Methods This cross-sectional study used 7-day recordings from wrist-worn accelerometers to compare PA between groups. We recorded inactive time, light (LPA) and moderate-vigorous physical activity (MVPA). We also measured novel metrics: intensity gradient (IG) reflecting PA intensity, and average acceleration (AA) reflecting PA volume. Parameters were compared across groups using ANOVA testing for normally distributed data and Kruskall-Wallis for skewed data. Correlation analysis explored associations between PA parameters and asthma measures. As AA was most closely correlated with asthma measures, we compared the highest and lowest AA quartiles using unpaired t and Mann-Whitney U tests, depending on normality.

Results 75 participants were recruited, 25 per group. Inactive time was significantly higher (p<0.001), and LPA (p=0.007), MVPA (p<0.001), IG (p<0.001) and AA (p<0.001) all significantly lower in DOW group compared to MHW and MOW groups, even after adjusting for age and BMI. For AA, notable correlations included beclometasone diproprionate-equivalent dose of inhaled corticosteroid (r=-0.591, p<0.001), asthma-related quality of life score (r=0.531, p<0.001) and six-minute walk distance (r=0.719, p<0.001). Highest and lowest AA quartiles revealed significant differences in 14 of 21 asthma outcomes including the above, and pre-bronchodilator forced expiratory volume in 1 second, 6-point asthma control questionnaire and BMI.

Conclusions Participants with difficult-to-control asthma who were overweight/obese performed less physical activity, and activity of reduced intensity and volume compared to

Abstract P50 Table 1

	MHW (mild-moderate healthy weight)	MOW (mild-moderate overweight)	DOW (Difficult-to-control overweight asthma)	P value (MHW vs. MOW vs. DOW)
Inactive time	1079 (1037- 1122)	1128 (1094 to 1161)	1202 (1170 -1234)	**<0.001**
LPA	259 (228- 289)	237 (212 to 263)	196 (171 - 222)	**0.007**
MVPA	103 (80 - 127)	79 (58 to 99)	42 (33 - 52)	**<0.001**
Intensity gradient	-2.63 (-2.97 - -2.33	-2.62 (-2.74 - -2.55)	-2.85 (-2.96 - -2.73)	**<0.001**
Average acceleration	27.8 (21.7 - 31.0)	24.4 (20.4 - 27.5)	17.1 (13.7 - 20.5)	**<0.001**

Abbreviations used in table: LPA-low physical activity, MVPA moderate-vigorous physical activity.

Units: inactive time, LPA and MVPA- minutes per day, average acceleration- mg.

Data expressed as mean with 95% confidence intervals for inactive time, LPA and MVPA; and median and interquartile range for intensity gradient and average acceleration.

participants with milder asthma with normal or elevated BMI. Suboptimal physical activity profile is a treatable trait which should be targeted to improve asthma-related outcomes in appropriate patients.

Please refer to page A191 for declarations of interest related to this abstract.

P51 SPOT THE DIFFERENCE? COMPARISON OF CLINICAL CHARACTERISTICS OF PATIENTS WITH INDUCIBLE LARYNGEAL OBSTRUCTION (ILO) AND ASTHMA REFERRED TO A SEVERE ASTHMA AND AIRWAYS TERTIARY CENTRE

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Introduction and Objectives Patients referred our tertiary airways service are assessed for potential causation of complex breathlessness, including differential diagnosis of asthma and inducible laryngeal obstruction (ILO).

Newman et al (1995) found associations between particular patient variables when comparing patients with asthma and ILO. Further investigation of these and other variables may aid in differential diagnosis and understanding triggers and characterisation of ILO compared to asthma.

Methods Records for 70 patients with sole diagnoses of either asthma (n=34) or ILO (n=36) were reviewed to investigate patterns of association between a large range of variables relating to these conditions, including demographics, co-morbidities, hospital utilisation and medical treatment. Non-parametric statistics were used to compare diagnosis against categorical, interval and ratio data relating to these variables.

Results A number of significant associations were found between diagnosis and patient characteristics, summarised in table 1.

Results showed that certain demographic variables, co-morbidities and medical treatments differentiated these two groups.

Conclusions By continuing to characterise common clinical characteristics of ILO in comparison to asthma, it is hoped that differentiation from asthma and index of suspicion for ILO will be highlighted to help further understand this clinical condition that co-exists and can mimic asthma.

It is of particular interest in the ILO only group that documented symptoms of anxiety were lower than in the group with only asthma, which may help to dispel a common held belief that people with ILO have high anxiety burden.

P52 A SYSTEMATIC REVIEW OF THE EFFECTIVENESS OF EXISTING NON-PHARMACOLOGICAL INTERVENTIONS USED TO TREAT ADULTS WITH INDUCIBLE LARYNGEAL OBSTRUCTION

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Introduction Inducible laryngeal obstruction (ILO) describes transient laryngeal closure during respiration and can cause significant morbidity. Behavioural therapy is the commonly cited treatment but efficacy is largely unknown. Before a standardised approach can be developed, the potential components of intervention and their effectiveness should be understood.

Aim To synthesise the current evidence base on the effectiveness of existing non-pharmacological interventions used to treat adults with ILO.

Methods Electronic databases (MEDLINE/EMBASE/CINAHL/PsycINFO/AMED/CENTRAL) were systematically searched, informed by a PICO framework. Search terms were agreed by expert peer consensus. Two reviewers independently screened a representative sample, with lead-author completion due to excellent inter-rater reliability. Data was extracted using a predefined piloted form. Methodological quality was appraised (blindly by two reviewers) using the Joanna Briggs Institute Critical Appraisal Tools. A narrative synthesis was performed

Abstract P51 Table 1 Patient characistics according to diagnosis

Patient Characteristic	ILO	Asthma
Age	Higher mean age	Lower mean age
Gender	More females	More males
FEV1% predicted	Higher	Lower
FEV1/FVC ratio	Higher	Lower
Globus	More likely	Less likely
Stridor	More likely	Less likely
Dysphonia	More likely	Less likely
Dysphagia	More likely	Less likely
Laryngeal hypersensitivity	More likely	Less likely
Flattened inspiratory loop	More likely	Less likely
Wheeze	Less likely	More likely
Biologic therapy	Less likely	More likely
Prescribed anti-depressants	Less likely	More likely
Anxiety	Less likely	More likely

Abstract P52 Table 1 Effect direction plot summarising direction of outcome domains of included studies

Study	Study design	Symptoms (validated)	Symptoms (non-validated)	Objective measures	Healthcare utilisation
Hatzelis et al, 2012	CS		▲	▲	
Nacci et al, 2011	O/U		▲		
Pinho et al, 1997	CS			▲	
Baxter et al, 2019	O/U	▼		◄►	▲
Haines et al, 2016	O/U	▲			
Halevi-Katz, 2019	O/U	▲		◄►	
Krammer et al, 2017	O/C		▲		▲
Marcinow et al, 2015	O/U		▲		
Mathers-Schmidt & Brilla, 2005	CS		▲	◄►	
Murry et al, 2010	O/U	◄►	▲	▲	
Olley et al, 2013	O/U	▲		▲	
Pargeter & Mansur, 2016	O/U		▲		▲
Sandnes et al, 2019	O/U		▲	◄►	
Shin et al, 2018	O/U		◄►		
Warnes et al, 2005	CS		▲	▲	

Legend:

Study design: *O/U* Observational non-randomised uncontrolled before and after; *O/C* Observational non-randomised controlled before and after; *CS* Case Study

Effect direction: upward arrow ▲= positive impact; downward arrow ▼= negative impact; sideways arrow ◄►= no change/mixed effects/conflicting findings

Sample size: Final sample size (individuals) in intervention group. Large arrow ▲ >300; medium arrow ▲ 50-300; small arrow ▲ <50

Study quality: denoted by row colour and Joanna Briggs Institute ratings assigned : light grey = low risk of bias; Medium grey = some concerns; dark grey = high risk of bias

due to heterogeneity of studies (PROSPERO registration number:CRD42020213187).

Results Initial searching identified 3,359 records. Full text screening occurred in 92 records and 15 studies, comprising 555 participants, were deemed eligible. All studies were low level evidence (observational by design, with four case reports), with a high risk of bias; no studies contained control arms. Intervention description was inconsistently and poorly described but direction of effect was positive in 74% of outcomes measured (table 1). The majority of studies showed a reduction in symptom scores and improved direct laryngeal imaging post-intervention; there was an overall reduction, 59.5%, in healthcare utilisation.

Conclusion The literature is in an embryonic state and lacks robust data to truly inform on the effectiveness of existing non-pharmacological interventions used to treat adults with ILO. However, positive signals in the synthesis performed support non-pharmacological treatment approaches and further development is warranted.

P53 COMBINED EXPOSURE TO VAPORS, GASES, DUSTS, FUMES AND TOBACCO SMOKE INCREASES THE RISK OF ASTHMA SYMPTOMS ESPECIALLY IN ADULT-DIAGNOSED ASTHMA

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Background Smoking and occupational airborne exposures are known to increase asthma symptoms, but less is known about their influence by the age of asthma diagnosis.

Objective To evaluate the effect of exposures to VGDF (vapors, gases, dusts and fumes), tobacco smoke and their combination for asthma symptoms comparing subjects with asthma diagnosed in childhood and adulthood.

Methods A random sample of 16 000 adults aged 20–69 years were invited to a postal survey on obstructive pulmonary diseases in Finland in 2016. Those reporting physician-diagnosed asthma and age at diagnosis were included in the analysis and their reported VGDF-exposure and smoking habits were analyzed. Age 18 years was chosen to delineate child- and adult-diagnosed asthma.

Results 8199 (51.5%) responded. Of the responders, 831 reported physician-diagnosed asthma. 41% of asthmatics reported child-diagnosed and 59% adult-diagnosed asthma. Current smoking was reported by 25.2% and 20.2% and VGDF exposure by 31.3% and 44.7% in child -diagnosed and adult-diagnosed asthma, respectively. Combined VGDF-exposure and current smoking was reported by 9.7% and 10.6%, respectively.

Compared to the unexposed, those with asthma diagnosed in childhood and with combined current smoking and VGDF exposure, had higher prevalence of wheeze (69.7% vs 39.5%, p=0.009), sputum production (39.4% vs 11.4%, p=0.001) and morning dyspnea (42.4% vs 21.9%, p=0.002). Corresponding pattern was seen in those with asthma diagnosed in adulthood; for wheeze (78.8% vs 53.6%, p=0.007), sputum production (40.4% vs 25.0%, p=0.014) and morning dyspnea (65.4% vs 42.0%, p=0.008). Child-diagnosed asthmatics both without exposure history (46.5% vs 69.6%, p=0.001) and with combined exposure to smoking and VGDF (66.7% vs 94.2%, p=0.003) reported less often ≥3 symptoms compared to adult-diagnosed asthmatics, even though they reported less frequently use of asthma medication (60.7% vs 82.0%, p>0.001). Smoking asthmatics with adult-diagnosis and exposure to VGDF had the highest prevalence estimates of having multiple symptoms (94.2%) in our study.

Conclusion Although asthmatics diagnosed in child- and adulthood reported symptoms related to exposure to smoking and

VGDF, symptoms were reported more often by those with adult diagnosis. The results indicate the importance of targeted asthma treatment and follow-up by patient's exposure history and asthma diagnosis age.

P54 COMBINED EXPOSURE TO VAPORS, GASES, DUSTS, FUMES AND TOBACCO SMOKE INCREASES THE RISK OF ASTHMA SYMPTOMS

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10.1136/thorax-2021-BTSabstracts.164

Background Occupational exposure to vapors, gases, dusts and fumes (VGDF) is known to increase the prevalence of asthma symptoms. Less is known about the prevalence of asthma symptoms if VGDF exposure is combined to smoking or environmental tobacco smoke exposure.

Objective To test the hypothesis that combined exposure to VGDF and tobacco smoke would have an additive effect on the risk for being symptomatic in responders with physician diagnosed asthma.

Methods A random sample of 16 000 adults aged 20 to 69 years were invited to a postal survey on obstructive pulmonary diseases in Finland in 2016. Those who reported physician diagnosed asthma were included in the analysis and their reported VGDF exposure and smoking habits were analyzed. Being symptomatic was defined as an affirmative answer to three or more questions of asthma symptoms.

Results 8199 (51.5%) subjects responded. Of the responders, 831 reported physician-diagnosed asthma. 22.3% of asthmatics reported current smoking, 23.2% exposure to environmental tobacco smoke and 39.4% occupational exposure to VGDF. 14.0% reported combined exposure to environmental tobacco smoke and VGDF, and 10.2% exposure to VGDF and smoking. The prevalence of being symptomatic was increased in smokers (73.0% vs 58.0%, $p=0.005$) and in responders with occupational exposure to VGDF (75.2% vs 58.0%, $p<0.001$) compared to unexposed asthmatics. The highest prevalence estimates were seen in smokers with VGDF exposure (83.5% vs 58.0%, $p<0.001$) and in responders with exposure to both VGDF and environmental tobacco smoke (85.3% vs 58.0%, $p<0.001$) suggesting their additive effect on the prevalence of asthma symptoms. There was no difference in asthma medication use between responders with no exposure history, smokers or those with environmental tobacco smoke or occupational VGDF exposure.

Conclusion Our results indicate an increased prevalence of asthma symptoms in adult asthmatics with exposure to VGDF and tobacco smoke. Asthmatics with exposure to both environmental tobacco smoke and VGDF had the highest prevalence estimates of asthma symptoms suggesting an additive effect. These results suggest the importance of prevention of occupational airborne exposures and smoking cessation in asthma treatment.

P55 OCCUPATIONS, WORKPLACE EXPOSURES AND PHYSICAL DEMANDS OF WORK IN PATIENTS WITH SEVERE ASTHMA

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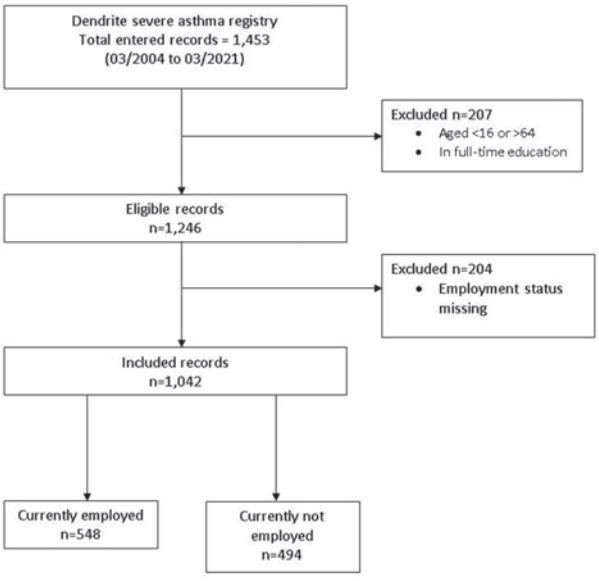
Introduction Patients with severe asthma are a group distinct from those with mild or moderate disease, due to their complex healthcare needs. Employment is common in this group, and complete work disability unusual. Asthma-related loss of productivity may be higher compared with patients with non-severe asthma, and has been attributed to both physical and psychological impairments. We aimed to gain an understanding of the nature of work undertaken by patients with severe asthma.

Methods We searched the Birmingham (UK) Regional Severe Asthma Service (BRSAS) Dendrite clinical registry and included baseline demographic, current employment, and asthma-specific health data on employed patients (see figure). Recorded occupations for each included patient were processed by: (i) assigning a 4-digit SOC-2010 code, (ii) applying the OASJEM (job exposure matrix[1]) to determine likelihood of exposure to airway irritants and respiratory sensitizers, and (iii) assigning a 'physical demand' category (sedentary to very-heavy), using the Dictionary of Occupational Titles (DOT[2]).

Results Data from n=548 patients were included (53% of severe asthmatics were employed, 86% of those working full-time); median age=44 (IQR=33–52), females=367 (67%), Caucasian ethnicity=453 (84), current smokers=27 (5), median IMD decile=5 (2–7), median BMI=30 (25–35), ≥1



Abstract P55 Figure 1

major comorbidity=204 (37), median%predicted FEV_1=80 (58–96). The most frequently identified occupations were: office administrator=48 (10), nurse=43 (9), care assistant (personal or institutional) =34 (7), teacher=21 (4), teaching assistant=18 (4). Using OASJEM 186/504 (37) patients may be exposed to ≥1 respiratory sensitizer or airway irritant, and 140/504 (28) to both categories. Physical demand of work was categorised as follows: sedentary=186/504 (37), light=220 (44), medium=88 (17), heavy=10 (2). Patients employed in medium or heavy physical work had median% FEV1/FVC=66 (52–79), median%predicted FEV1=75 (50–96), and median ACQ7score=2.9 (2.0–3.7).

Conclusion Clinicians should enquire about, and exclude, work-related inhalational exposures that may cause or exacerbate symptoms in patients with severe asthma. Clinicians should also be aware of unrecognized work disability, since many patients are employed in physically demanding roles, despite the presence of airflow obstruction and poor asthma control.

REFERENCES

1. Le Moual N, *et al*. *Occup Environ Med*. 2018;**75**(7):507–14.
2. Miller AR, *et al*. *Work, Jobs, and Occupations: A Critical Review of the Dictionary of Occupational Titles*. Washington DC: National Academy Press, 1980.

Cough: is it a problem and what can we do about it?

P56 CHRONIC COUGH IN GERMANY: PREVALENCE AND PATIENT CHARACTERISTICS

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10.1136/thorax-2021-BTSabstracts.166

Introduction Prevalence and characteristics of chronic cough (CC) in Germany are poorly understood.

Aims and objectives The study aims to estimate prevalence and characterize a cohort of patients with chronic cough in Germany.

Methods German adults (n=15020) completed the National Health and Wellness Survey. CC was defined as daily cough ≥ 8 weeks. Respondents with CC were compared to those without CC on the following measures: Demographics, Health-Related Quality of Life (HRQoL) [Short Form 12 (SF-12): SF-6D utility index score, Mental Component Summary (MCS) score, Physical Component Summary (PCS) score], productivity loss [Work Productivity and Activity Impairment questionnaire]; anxiety [General Anxiety Disorder Scale-7], and depression [Patient Health Questionnaire-9]. All data shown $p<0.01$ unless stated.

Results Of participants, 5.1% (weighted) and 4.9% (unweighted) reported CC during the previous 12 months. Compared to non-CC respondents, CC patients were older (52 vs. 50 years) with similar proportion of females (54% vs. 51%, p=.22). CC patients were more likely to have a smoking history (71% vs. 54%) and less likely to exercise (55% vs. 61%). CC patients were more frequently employed (45% vs. 56%), although employed CC patients reported greater impaired productivity (47% vs. 25%). HRQoL was lower for CC patients in the SF-6D utility score (0.62 vs. 0.72), MCS (42.5 vs. 47.9), and PCS (42.8 vs. 49.2). CC patients were more likely to be obese (30% vs. 21%), and experience symptoms of severe depression (7.2% vs. 2.5%) and anxiety (9.7% vs. 3.1%).

Conclusions In the past year, 4.9% percent of German adults report suffering from CC. Relative to non-CC respondents, CC was associated with poorer general health (e.g., higher BMIs, increased smoking, less exercise), poorer mental health, lower HRQoL, and reduced productivity.

Please refer to page A191 for declarations of interest related to this abstract.

P57 PATIENT GLOBAL IMPRESSION OF SEVERITY SCALE CHARACTERISES SYMPTOM SEVERITY IN CHRONIC COUGH

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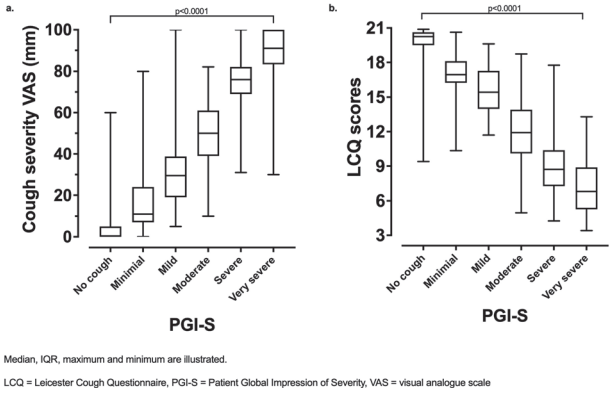
Introduction The Patient Global Impression of Severity (PGI-S) scale is a simple validated, single-item, self-reported categorical scale. The PGI-S is used to assess the severity of different clinical conditions, including as an outcome measure in clinical trials and in economic modelling. The aim of this study was to investigate the relationship of an adapted PGI-S scale to commonly-used specific measures in chronic cough, assessing both severity and health-related quality of life (QoL).

Methods Prospective study of consecutive patients with chronic cough being investigated at a specialist cough clinic. Participants completed cough severity visual analogue scale (VAS) (0–100 mm; higher scores indicate higher severity), Leicester Cough Questionnaire (LCQ) QoL (3–21; higher scores indicate better health status) and PGI-S (0–5: 0=no cough, 1=minimal, 2=mild, 3=moderate, 4=severe, and 5=very severe) at a clinic visit.

Results 304 participants completed the assessments; median (IQR) age 59 (47–67) years, 218 (72%) female, duration of cough 51 (24–123) months and mean (SD) $FEV_1$94.0 (19.7)% predicted. The distribution of reported PGI-S severity ratings



Abstract P57 Figure 1 Cough severity analogue scale (a) and cough-specific health status LCQ (b) ranges for Pateint Global Impression of Severity categories

were no cough (4%), minimal (7%), mild (12%), moderate (34%), severe (35%) and very severe (8%). Participants reported median (IQR) cough severity VAS 60 (32–80) mm, LCQ 11.2 (8.6–14.4) and PGI-S 3 (moderate) (3–4). PGI-S was associated with cough severity VAS and LCQ (rho=0.81, p<0.001; rho=-0.76, p<0.001 respectively). Cough severity VAS (median, IQR) was significantly different between PGI-S categories; no cough: 0 (0–5) mm, minimal: 11 (7–24) mm, mild: 30 (19–39) mm, moderate: 50 (39–61) mm, severe: 76 (69–82) mm and very severe: 91 (83–100) mm (p<0.001) (figure 1a). LCQ (median, IQR) was also significantly different between PGI-S categories; no cough: 20.3 (19.5–20.7), minimal: 17.0 (16.3–18.1), mild: 15.4 (14.0–17.3), moderate: 11.9 (10.1–13.9), severe: 8.7 (7.3–10.4) and very severe: 6.8 (5.3–8.9) (p<0.001) (figure 1b).

Conclusion The PGI-S scale is a simple tool that characterises cough severity in a format familiar to clinicians, and allows comparisons with other conditions. The PGI-S has a strong relation with validated cough measures such as VAS and LCQ. Future studies should investigate the reproducibility and clinically important threshold for change of the PGI-S.

P58 THE PREVALENCE OF CHRONIC COUGH AMONGST FEMALES WITH STRESS URINARY INCONTINENCE

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Background Stress Urinary Incontinence (SUI) is one of the major physical consequences suffered by individuals with chronic cough (CC). We investigated the prevalence of CC among women who reported having SUI.

Methods Participants completed an online structured quantitative questionnaire in April 2021, to identify adult women with SUI. Demographic characteristics, causes/triggers of urinary incontinence, current or previous CC, cough frequency and duration, COVID-19 infection and its impact on CC were included.

Results A total of 835 adult women reported having SUI, of whom, 153 (18.3%) concomitantly had urgency incontinence, 59 (7.1%) had overflow incontinence, and 28 (3.4%) had functional incontinence. The mean age was 52.3 years (Range: 21–86), the majority (604 (72.3%)) reported cough as a cause of their urinary incontinence, of whom 67.0% reported suffering incontinence because of cough at least once a week. One hundred and twenty-three (14.7%) women reported experiencing CC within the last year, and 84 (10.1%) reported still having CC currently. Fifty-seven (6.8%) women stated their CC had been diagnosed by a physician, and 150 (18.0%) women reported having suspected or confirmed COVID-19 (with or without CC). Of the 123 women who had CC in the last year, ninety-three (75.6%) had CC onset before COVID-19.

Conclusion A majority of women with SUI reported cough as one of the leading triggers of their urinary incontinence. Almost 15% of the sample reported experiencing CC, but less than half of those had a formal diagnosis from a physician. Most cases of CC were not related to COVID-19. Future studies would be useful to further explore the burden of CC on SUI patients.

Please refer to page A191 for declarations of interest related to this abstract.

P59 BASELINE CHARACTERISTICS AND MEDICAL HISTORY OF PATIENTS WITH REFRACTORY OR UNEXPLAINED CHRONIC COUGH PARTICIPATING IN TWO GLOBAL PHASE 3 CLINICAL TRIALS

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10.1136/thorax-2021-BTSabstracts.169

Introduction Previous studies characterizing patients with chronic cough (CC) have typically included patients with CC without a specific focus on patients with guidelines-diagnosed refractory CC (RCC) or unexplained CC (UCC). This analysis assessed the medical history, cough severity, and cough-related quality of life (QOL) at baseline in participants with RCC and UCC enrolled in two global phase 3 trials.

Methods Pooled data from participants enrolled in two phase 3, randomized, placebo-controlled clinical trials of the P2X3-receptor antagonist gefapixant (COUGH-1, NCT03449134; COUGH-2, NCT03449147) were used in this analysis. Participants were adults with cough lasting ≥1 year, a diagnosis of RCC or UCC according to guidelines from the American College of Chest Physicians, and a baseline cough severity score ≥40 mm on a 100-mm visual analog scale. Comorbidities and prior medications were identified from participant medical records. Baseline cough metrics included the Cough Severity Diary (CSD) and Leicester Cough Questionnaire (LCQ). The CSD measures cough severity across 3 domains (frequency, intensity, and disruption), with items measured on an 11-point scale (higher scores indicate greater severity). The LCQ assesses health-related QOL, including physical, psychological, and social domains, with a total score ranging from 3 to 21 (lower scores indicate a more impaired QOL).

Results Of 2044 participants randomized and treated in COUGH-1 or COUGH-2, 41%, 41%, and 29% had prior

Abstract P59 Table 1 Pooled Baseline CSD and LCQ Scores in COUGH-1 and COUGH-2

	Mean (SD)	Median (range)
CSD (N=2038)		
Total	6.0 (1.6)	6.1 (0.7–10.0)
Frequency	6.4 (1.5)	6.5 (0.8–10.0)
Intensity	6.2 (1.8)	6.4 (0.1–10.0)
Disruption	5.3 (2.1)	5.4 (0.0–10.0)
LCQ (N=1949)		
Total	10.4 (3.0)	10.3 (3.0–20.5)
Physical	3.9 (1.0)	3.9 (1.0–6.8)
Psychological	3.2 (1.2)	3.1 (1.0–7.0)
Social	3.2 (1.2)	3.3 (1.0–7.0)

CSD, Cough Severity Diary; LCQ, Leicester Cough Questionnaire.

diagnoses of asthma, gastroesophageal reflux disease, and rhinitis/upper-airway cough syndrome, respectively; 8% had prior diagnoses of all 3 conditions. Prior medications were consistent with treatments indicated for these comorbidities or cough and included drugs for obstructive airway diseases (70%), acid-related disorders (55%), rhinitis preparations (nasal preparations, 53%; systemic antihistamines, 35%), and cough/cold preparations (34%). Baseline mean total CSD score (N=2038) was 6.0 and baseline mean total LCQ score (N=1949) was 10.4 (table 1).

Conclusions Participants in COUGH-1 and COUGH-2 with RCC or UCC had medical histories consistent with diagnostic and treatment workup of CC according to published guidelines. Participants also reported severe cough with significant cough-related QOL impairment. These data help characterize the profile of patients with RCC or UCC and highlight unmet needs for treatments that can relieve their cough burden.

Please refer to page A191 for declarations of interest related to this abstract.

P60 PATIENT-REPORTED IMPROVEMENTS WITH GEFAPIXANT, A P2X3-RECEPTOR ANTAGONIST, OVER 52 WEEKS IN TWO PHASE 3 CLINICAL TRIALS FOR REFRACTORY OR UNEXPLAINED CHRONIC COUGH

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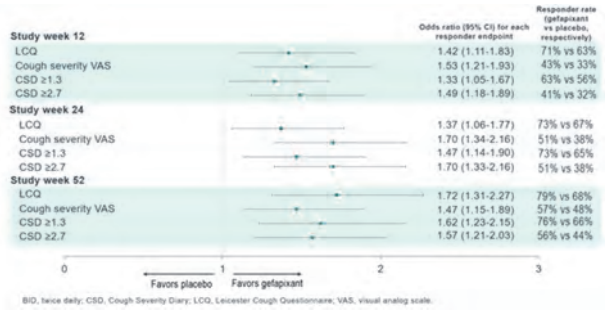
10.1136/thorax-2021-BTSabstracts.170

Introduction In two phase 3, randomized, double-blind trials of the P2X3-receptor antagonist gefapixant (COUGH-1 and COUGH-2), participants with refractory or unexplained chronic cough (RCC and UCC) demonstrated significant reductions in 24-hour cough frequency with gefapixant 45 mg twice daily (BID) following 12 (COUGH-1) and 24 (COUGH-2) weeks of treatment. Herein, we present a pooled analysis of patient-reported outcomes (PROs) and safety data from an extension of COUGH-1 and COUGH-2 through 52 weeks of treatment.

Methods COUGH-1 and COUGH-2 enrolled participants aged ≥18 years with chronic cough lasting ≥1 year, a diagnosis of RCC or UCC, and a baseline cough severity visual analog scale (VAS) score ≥40 mm on a 100-mm scale. Participants were randomized to receive placebo, gefapixant 15 mg BID, or gefapixant 45 mg BID for 52 weeks. The PROs used to evaluate efficacy included the Leicester Cough Questionnaire (LCQ), cough severity VAS, and Cough Severity Diary (CSD). Logistic-regression models evaluated change from baseline to week 52, where participants were classified as responders as follows: ≥1.3-point increase in LCQ total score, ≥30-mm reduction in mean weekly cough severity VAS, and ≥1.3- and ≥2.7-point reductions in mean weekly CSD total score. Adverse events (AEs) were monitored. Because efficacy was only demonstrated with gefapixant 45 mg BID, only the placebo and gefapixant 45 mg BID cohorts are presented in this report.



Abstract P60 Figure 1 Patient-reported outcomes for gefapixant 45 mg BID vs placebo at weeks 12, 24, and 52 pooled across COUGH-1 and COUGH-2

Results There were 2044 participants included in the pooled data set. Across all PROs and time points, gefapixant 45 mg BID was consistently favored over placebo (figure 1). Frequently reported AEs were taste related. Discontinuations due to taste-related AEs were 14% vs <1% in the gefapixant 45 mg BID vs placebo cohorts, respectively. Serious AEs occurred in 6% of participants in each cohort.

Conclusions Treatment for 52 weeks with gefapixant 45 mg BID resulted in clinically meaningful patient-reported efficacy relative to placebo across all PROs. Taste-related AEs led to discontinuations in a small proportion of participants who received gefapixant, and the occurrence of serious AEs with gefapixant was similar to that of placebo. These data support the long-term, patient-relevant efficacy of gefapixant 45 mg BID for treatment of RCC or UCC.

P61 POOLED ANALYSIS OF OBJECTIVE COUGH FREQUENCY IN PARTICIPANTS WITH CHRONIC COUGH TREATED WITH GEFAPIXANT IN TWO PHASE 3 CLINICAL TRIALS (COUGH-1 AND COUGH-2)

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Introduction Chronic cough (CC) is a relatively common condition often associated with comorbidities such as asthma, gastroesophageal reflux disease, or upper-airway cough syndrome. A subset of patients experience CC that does not resolve after treatment of cough-associated conditions (refractory CC [RCC]) or for which there is no known cause of CC despite clinical evaluation according to published guidelines (unexplained CC [UCC]). However, no treatments are currently approved for RCC or UCC. In two large phase 3 trials (COUGH-1, NCT03449134; COUGH-2, NCT03449147), the P2X3-receptor antagonist gefapixant demonstrated significant reductions in the primary endpoint (24-hour cough frequency) in participants with RCC or UCC at a dosage of 45 mg twice daily (BID) vs

placebo.[1] The current analysis assessed objective cough frequency in the pooled population of COUGH-1 and COUGH-2.
Methods Adults aged ≥18 years with CC lasting ≥1 year, a diagnosis of RCC or UCC according to CHEST guidelines, and a baseline cough severity visual analog scale score ≥40 mm were eligible for COUGH-1 and COUGH-2. Participants were randomized to placebo, gefapixant 15 mg BID, or gefapixant 45 mg BID. Objective cough frequency was measured using the VitaloJAK™ (Vitalograph; Buckinghamshire, England) recording device. Cough frequency endpoints included 24-hour and awake cough frequency assessed through Weeks 12 and 24 (COUGH-1 and COUGH-2, respectively). Data were pooled across trials and analyzed at Week 12 using longitudinal analysis of covariance based on log-transformed data.
Results The pooled population from COUGH-1 and COUGH-2 included 2044 total participants. Baseline 24-hour and awake cough frequency were similar across treatment groups (table 1). Relative reductions in 24-hour and awake cough frequency for gefapixant 45 mg BID vs placebo were 18.6% (95% CI: 9.2, 27.1) and 17.4% (95% CI: 7.5, 26.2), respectively. No differences in serious adverse events (AEs) were observed across treatment groups. The most common AEs with gefapixant were taste related.

Abstract P61 Table 1 Relative Reduction in 24-Hour and Awake Cough Frequency in COUGH-1 and COUGH-2

	Baseline GM, coughs/h	Week 12 GM, coughs/h	Model-based GMR,[a] Week 12/ Baseline (95% CI)	Relative reduction in cough frequency vs placebo, % (95% CI)
24-hour cough frequency				
Placebo	20.9	9.9	0.48 (0.44, 0.52)	—
Gefapixant 15 mg BID	19.3	9.1	0.47 (0.43, 0.51)	1.0 (-10.4, 11.2)
Gefapixant 45 mg BID	18.6	7.3	**0.39** (0.36, 0.42)	18.6 (9.2, 27.1)
Awake cough frequency				
Placebo	27.7	12.7	0.46 (0.43, 0.50)	—
Gefapixant 15 mg BID	25.3	11.8	0.46 (0.43, 0.51)	- 0.3 (-12.1, 10.3)
Gefapixant 45 mg BID	24.3	9.4	**0.38** (0.35, 0.42)	17.4 (7.5, 26.2)

BID, twice daily; GM, geometric mean; GMR, GM ratio.
[a]Based on the longitudinal covariance model consisting of the change from baseline in log-transformed coughs/h at each postbaseline visit (up to Week 12) as response.

Conclusions COUGH-1 and COUGH-2 are the largest clinical trials investigating treatment of CC. In this pooled analysis, gefapixant 45 mg BID demonstrated significant reductions in 24-hour and awake cough frequency vs placebo, with no increase in serious AEs.

REFERENCE

1. McGarvey, *et al*. *Eur Respir J*. 2020;**56**(suppl 64):3800.

Please refer to page A192 for declarations of interest related to this abstract.

Breaking barriers in pulmonary rehabilitation and physiotherapy

P62 USE OF A COMPUTER GUIDED CONSULTATION (CLINICAL DECISION SUPPORT SYSTEM) ENABLES DETAILED CHARACTERISATION OF PATIENTS PRESENTING TO A TEACHING CENTRE SLEEP SERVICE AND SHOWS THAT INSOMNIA IS FREQUENTLY REPORTED IN THIS PATIENT GROUP

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Background Patients attending primary care with possible Obstructive Sleep Apnoea (OSA) often describe difficulty getting off to sleep or maintaining sleep. This can be mistaken for insomnia by the referring doctor leading to some referrals being rejected, especially if no other information is available. In our service a clinical decision support system (CDSS) has been implemented which allows gathering of more detailed descriptive data and sleep history including insomnia symptoms. We investigated the frequency of initiation and maintenance insomnia in patients attending Liverpool Sleep and ventilation service.
Methods All patients attending Liverpool Sleep and Ventilation service from March- June 2021 were taken through the CDSS, with patients' detailed history, demographics, diagnosis, investigation and treatment documented. All patients answer time to get to sleep, whether they experience difficulty falling asleep, disturbed sleep or nocturia. Output from the database was imported into excel for statistical analysis. Only patients with valid sleep study results were included.
Results A total of 325 patients were reviewed through the CDSS. 282 had a completed sleep study of which 250 had a confirmed diagnosis of OSA, mild, moderate, severe or no evidence of OSA and the remaining 32 had a possible diagnosis of OSA requiring further review. Of the confirmed diagnosis there were a higher proportion of males in the

Abstract P62 Table 1

		OSA (199)	No OSA (51)
Age		52.5	41.6
Male%		59%	29%
BMI		37.4	31.8
ESS		10.4	10.6
AHI		25.3	1.8
ODI		31.7	3
Time >1 hr =1		**50** (25%)	**12** (24%)
Difficult to get to sleep = 2		**118** (59%)	**32** (62%)
Difficult to remain asleep = 3		**141** (71%)	**35** (69%)
Nocturia		1.8	1.3
Sleep induction–>	**1+2 (59)**	**47** (24%)	**12** (24%)
	2+3 (119)	**91** (46%)	**28** (55%)
	1+3 (122)	**94** (47%)	**28** (55%)
	1+2+3 (43)	**33** (17%)	**10** (20%)

OSA group compared with not OSA along with higher AHI and ODI. The BMI were similar between the two groups and there was no difference in the ESS. We then compared the symptoms of initiation and maintenance insomnia between the two groups. 75% of patients with confirmed diagnosis of OSA experienced insomnia symptoms. We found that there was no difference in symptoms of time to get to sleep, difficulty to get to sleep and difficulty to remain asleep between those with OSA and those with no evidence of OSA. (see table 1).

Conclusion This suggests there is a large proportion of patients presenting to our service with difficulty falling or staying asleep. There are a similar proportion of patients describing these initiation and maintenance insomnia symptoms in those diagnosed with OSA compared to those where OSA was excluded.

P63 ASSESSING WHICH PATIENT RELEVANT FEATURES OF AN OSCILLATING POSITIVE EXPIRATORY PRESSURE (OPEP) DEVICE ARE MOST IMPORTANT IN THE REAL WORLD – RESULTS FROM AN INDEPENDENT CLINICAL ASSESSMENT IN UK

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Introduction and Objectives OPEP devices can be used to manage a number of different respiratory conditions by providing airway clearance therapy to mobilize and clear excess mucous from the lungs. This assessment investigated the relative importance of a number of different patient relevant features when selecting an OPEP device.

Methods The survey was completed, as part of an independent clinical assessment of an OPEP device (Aerobika*, Trudell Medical International), across 23 UK centres by respiratory physiotherapists. They were asked to note, for each patient, the respiratory condition being managed and to select which device features would be important when selecting an OPEP device for that patient. Up to fourteen different features could be selected and these covered topics related to a) ease of use/cleaning, b) clinical adaptability/evidence and c) device robustness/quality.

Results Data related to 156 individual patients was collected, covering CF, bronchiectasis and COPD conditions. The most important features noted were generally related to device ease of use and associated attributes. These were highest overall and for each specific respiratory condition. Orientation independence and the ability to easily take apart and clean were identified specifically as high rating factors. When the data was analysed by respiratory condition and the top 5 features compared, there was generally agreement across different conditions, although interestingly the attribute 'clinically proven' was of a greater relative importance when selecting for COPD and bronchiectasis patients than for CF and the ability to use at low expiratory flows was higher rated for COPD than the other two conditions.

Conclusions In conclusion, the results reflect the pragmatic and clinically relevant perspective of selecting a device that a patient can easily use and therefore is more likely to use in the real world.

Please refer to page A192 for declarations of interest related to this abstract.

P64 PREVALENCE OF BREATHING PATTERN DISORDERS WITH CHRONIC REFRACTORY COUGH AND THE OUTCOMES OF PHYSIOTHERAPY MANAGEMENT

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Background Chronic refractory cough (CRC) is described as a cough that persists despite guideline-based treatment. Once medical management is optimised the mainstay of treatment is to reduce upper airway hypersensitivity. The prevalence of breathing pattern disorders (BPD) with CRC is increasingly recognised and treatment by specialist respiratory physiotherapists (SRP) aims to reduce symptom burden.

Objectives

- To determine the prevalence of comorbid BPD with CRC.
- To assess improvement in cough following SRP input.

Methods We reviewed 34 patients (79.4% female) with CRC referred to a SRP over a 6 month period. Patients were assessed for BPD and treatment included breathing pattern retraining alongside cough management and suppression techniques. Cough severity and impact of cough on quality of life (QOL) was scored on a 10-point visual analogue scale (VAS) pre and post treatment.

Results

- Average length of CRC was 7.8 years (range 1–25 years)
- Patients were reviewed by the same SRP an average of 3 times (range 2–5)
- 33/34 (97%) had a comorbid BPD as assessed by the SRP
- 31/34 completed treatment with 28/31 (90%) reporting improvement in symptoms

Abstract P64 Table 1

	Pre SRP intervention	Post SRP intervention	P value
VAS score for Cough severity (median, range)	6, 3–10	2, 0–10	<0.0001
VAS score for QOL related to cough (median, range)	6, 0–10	2, 0–7	<0.0001

Conclusion BPD commonly coexists with CRC.

SRP intervention in patients with CRC improves symptoms and quality of life related to cough.

SRP should therefore be an integral part of a CRC clinic, with routine assessment for BPD carried out.

P65 REMOTE DELIVERY OPTIONS FOR SELF-MANAGEMENT PROGRAMMES FOR PATIENTS WITH COPD DURING THE COVID-19 PANDEMIC. UPTAKE, COMPLETION AND CLINICAL OUTCOMES

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Introduction Face-to-face pulmonary rehabilitation (PR) programmes were largely stopped in the UK in March 2020 due

to concerns about the transmission of the COVID-19 virus. However there was still a need to support patients with COPD to self-manage their condition. Indeed social isolation and deconditioning were cause for concern in this population. The aim of this work was to gauge the appetite for 3 different models of remote self-management support and to explore the uptake, completion and clinical outcomes of these 3 options.

Methods Between March 2020- March 2021, 3 remote options for self-management were offered: telephone support (TP: biweekly for 6weeks with home exercise and education booklet), SPACE for COPD Manual (SM: with phone calls at week 2 and week 4), SPACE for COPD Website (SW: email prompts and contact health professional function). All patients had a subjective assessment (including risk assessment) completed over the phone. All programmes included self-management education and a home exercise programme (walking, strength exercises using free weights). Outcomes assessed were: uptake and completion rates, COPD Assessment Test (CAT), Chronic Respiratory Questionnaire (CRQ)- all domains.

Results N=287 patients chose a remote option and were included in the analysis. All patients had a spirometry diagnosis of COPD. Mean (SD) age 66.4 (10.2) years. 67% chose TP, 22% chose SM, 11% chose SW. Completion rates were: 56% TP, 52% SM and 30% SW (significant $p<0.05$ between TP and SW). Table 1 displays the change in outcomes for the 3 choices. There were within group improvements for all outcomes, all meeting the clinically relevant thresholds in this population (except for the CRQ-fatigue and emotion domains in the TP group). There were statistically significant changes in a number of outcomes (*) but no between group differences.

Abstract P65 Table 1

Change in…	TP	SM	SW
CAT	-2.4 * C	-3.1 * C	- 7.2 C
CRQ- Dyspnoea	0.8 * C	0.5 * C	1.1 * C
CRQ- Fatigue	0.4 *	0.8 * C	0.9 C
CRQ- Emotion	0.4 *	0.8 * C	1.4 C
CRQ- Mastery	0.6 * C	0.5 C	0.8 C

*: Statistically significant $p<0.05$
C: clinically relevant (meets MCID for this population)

Conclusion Most patients chose bi-weekly telephone support, TP and SM had the highest completion rate. All options were equally effective in terms of clinical outcomes. Despite being clinically effective, more work is needed to promote completion in digitally delivered self-management programmes.

P66 DOES AN INNER CITY LONDON VIRTUAL PULMONARY REHABILITATION PROGRAMME PRODUCE CLINICALLY SIGNIFICANT IMPROVEMENTS IN PATIENT OUTCOMES?

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Background The COVID-19 pandemic led to the suspension of Pulmonary Rehabilitation (PR) across the United Kingdom (UK). Services had to rapidly redesign to deliver rehabilitation within new limitations. As per many PR services the Adult Cardiorespiratory Enhanced and Responsive (ACERS) switched to deliver PR virtually, adapting the face to face programme to a virtual model. Patient outcomes were then analysed to see if they were clinically significant, achieving the minimal clinical important difference (MCID) and could offer a comparable alternative to face to face PR.

Method Following a comprehensive remote subjective assessment, patients attended a face to face objective assessment completing two incremental shuttle walk tests, the Chronic Obstructive Pulmonary Disease (COPD) Assessment Test (CAT), COPD Patient Reported Experience Measure 9 (COPD PREM 9), and the Hospital Anxiety and Depression Scale (HADS).

The virtual PR (VPR) programme ran twice weekly for six weeks, with a cohort of six patients and delivered was by a Physiotherapist and Rehabilitation Assistant over Microsoft Teams. The one and half hour programme contained cardiovascular, upper and lower limb strengthening exercises, modified from the face to face programme followed by an education session. Outcomes were then analysed to see they were clinically significant.

Results In total 53 patients started VPR during 2020/21, 62.26% (n=33) female, mean age 60, 62.3% (n=33) COPD,

Abstract P66 Table 1 Patient demographic data of those patients assessed and completed the Virtual PR programme

Patient demographic (n=53)			
Female (%)	33 (62.3%)		
Smoker (%)	16 (30.2%)		
Non Smoker (%)	8 (15.1%)		
Age (years) (range)	60 (37 to 81)		
Primary Disease			
COPD	33 (62.3%)		
Asthma	10 (18.9%)		
Other (bronchiectasis, ILD, lung cancer)	10 (18.9%)		
FEV1/FVC ratio	0.68		
FEV1% predicted	66.08% (20 to116%)		
MRC (Range)	3 (1 to 5)		
Outcomes			
	Pre (n=53)	Post (n=26)	Mean change
ISW (m) (range)	297.14m	382.66m	31.25m
	(40 to 1020 m)	(80m to 650m)	(-80m to +110m)
CAT (range)	23.73	19.83	1.26
	(8 to 36)	(5 to 32)	(-13 to +11)
COPD PREM 9 (range)	19.20	16.31	2.35
	(0 to 32)	(3 to 34)	(-18 to +21)
HADS A (range)	9.56	8.13	1.56
	(0 to 21)	(1 to 18)	(-18 to +11)
HADS D (range)	8.51	7.54	0.86
	(1 to 14)	(1 to 18)	(-7 to +9)

Key: COPD: Chronic Obstructive Pulmonary Disease (COPD), ILD: Interstitial Lung Disease, FEV1: Forced expiratory Volume in one second, FVC: Forced Expiratory Volume, MRC: medical research council breathlessness scale, ISW: Incremental Shuttle Walk Test; CAT: COPD Assessment Test, COPD PREM: Chronic Obstructive Pulmonary Disease Patient Reported Experience Measure 9; HADS: Hospital Anxiety and Depression Scale: A: anxiety domain, D: depression domain

30.2% (n=16) were current smokers, with a mean Medical Research Council (MRC) breathlessness grade 3) (table 1).

Of those assessed 48.15% (n=26) completed, of those who started (n=36) 72.22% completed. Only the HADS anxiety domain demonstrated a clinically significant improvement in mean score post VPR (table 1). The COPD PREM 9 does not have an MCID, however completion of VPR lead to a mean improvement in score of 2.35.

Conclusion Completion of an inner City London VPR programme did improve levels of anxiety and improved patient experience of living with disease, clinically significant improvements in exercise tolerance or symptom burden were not demonstrated. VPR provided a solution for delivering PR during the pandemic, however greater comparison against traditional face to face PR models is required to ensure it delivers the same healthcare and patient outcomes.

P67 PILOT PROJECT: FEASIBILITY OF MINIMAL-EQUIPMENT HIGH-INTENSITY INTERVAL EXERCISE (HIIE) INTERVENTIONS IN BRONCHIECTASIS PATIENTS

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Introduction Minimal-equipment interval-type interventions offer a cost-effective way to improve the exercise adherence, fitness, and symptoms of bronchiectasis patients in the home setting. Of the approaches this might include, stair and walking-based high-intensity interval exercise (HIIE) have emerged as potentially safe, practical, and time-efficient methods for use by previously untrained and clinical populations in the home. However, the feasibility of using these methods to prescribe HIIE safely and effectively to bronchiectasis patients is yet to be explored.

Methods Following baseline physiological assessment (6MWT, CST, IQST) five non-cystic fibrosis bronchiectasis patients (2 men, 3 women, 68 ± 5 years) completed four differing step or walking-based HIIE formats in a randomised order across four supervised trials. HIIE sessions comprised of either 3 x 20 sec 'all out' stepping, 3 x 60 sec 'vigorous' stepping, 3 x 60 sec 'all out' walking, or 3 x 180 sec 'vigorous' walking. Patients were then asked to complete 6 weeks of unsupervised home-based HIIE, choosing their preferred HIIE format on 3 days per week, after which baseline physiological assessments were repeated.

Results No adverse events were reported and all HIIE formats were tolerated by patients (mean heart rate and ventilation across formats: 78 ± 5% HR_{max} and 35.4 ± 10.0 $L{\cdot}min^{-1}$, respectively). Patients successfully completed 3.1 ± 0.5 sessions per week of unsupervised home-based HIIE. The most popular format was 3 x 60 sec of 'all out' walking, which comprised 46% of all sessions completed. Paired samples t-tests showed home-based HIIE significantly improved 6MWT (483 ± 79 vs 574 ± 58 m, $p < .05$) and CST (23 ± 5 vs 28 ± 4 $ml{\cdot}kg{\cdot}min^{-1}$, $p < .05$) outcomes.

Conclusion This data suggests step and walk-based HIIE is feasible, safe, well tolerated and effective for bronchiectasis patients. The engagement and enjoyment reported by patients suggests HIIE may offer an effective approach for prescribing unsupervised exercise to bronchiectasis patients, particularly when such prescription incorporates different choices of HIIE format. We therefore plan to investigate the effectiveness of these approaches to HIIE in a fully powered clinical trial and subsequently compare the benefits to other commonly prescribed formats of exercise.

P68 A RETROSPECTIVE SERVICE EVALUATION OF A VIRTUAL RESPIRATORY PHYSIOTHERAPY OUTPATIENT CLINICAL SERVICE

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Aim To review the effectiveness of a virtual service delivery for Airway Clearance in a chronic respiratory population.

Methods A retrospective audit of virtual provision of Airway Clearance to a respiratory outpatient population. Patient's attendance and outcomes were reviews

Results 47 patients (36% male, mean (SD) age 57 (16) were referred to the respiratory outpatient physiotherapy service for ACT between March 2020–2021.

70% had a diagnosis of bronchiectasis. 87% attended appointments virtually with 74% via video call. To establish an effective ACT it took 2 appointments of 30 minutes. Figure 1 describes ACT taught. 5% (2) of patients did not have English as their first language, requiring advocates to translate. Of those who attended virtually, 1 patient was admitted to hospital within 3 months of being discharged from the service with an infective exacerbation of bronchiectasis.

6% (3) declined a virtual consultation with their main reason being access to technology. 60% (2) were male with an average age of 46. Our DNA rate was 18%.

Discussion Our findings indicate that virtual clinics are feasible for respiratory assessments and teaching an ACT. Patients could be taught different types of ACT within a few appointments, with no adverse events. The impact of the COVID pandemic resulted in changes to outpatient services with an immediate effect. Therefore patients had limited choice on their appointment type and so it is difficult to compare these outcomes to face to face clinics from previous years. This change in practice did overcome other historical barriers prior to the pandemic ie. Travel distance and cost and infection control. Admission rates may have been lower due to shielding, resulting in reduced exposure. They do not reflect exacerbations managed at home via GP's.

Further work is required to identify the long term carry over and effectiveness of these treatments. Qualitative data on patient's perceptions of a virtual clinic would guide any long term changes to the service.

Conclusion Virtual outpatient clinics for respiratory physiotherapy are feasible. The change in service design may

Abstract P68 Figure 1

	total virtual and telephone	%	virtual	telephone
Number taught acapella	24	58%	22	2
Number taught ACBT	16	40%	12	4
Number taught other	1	2%	1	0

improve access to our service and indicates a potential path for digital transformation within respiratory outpatient physiotherapy.

P69 DOES PATIENTS' EXPERIENCE IMPROVE ON THE PREM-9 AFTER A 6-WEEK PULMONARY REHABILITATION PROGRAMME?

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Introduction Evidence suggests that PR has a huge impact on a number of outcomes for patients with Chronic Obstructive Pulmonary Disease (COPD).[1] However, limited data exists that has measured patients' experience of COPD pre and post rehabilitation. This study aimed to quantify the impact of PR on the experience of COPD patients using the Patient Reported Experience Measure 9 (PREM-9).[2] The PREM-9 is a questionnaire designed to help health care professionals (HCPs) learn more about the patient experience of living with COPD.

Methods Patients with COPD attending a 6 week PR programme in the United Kingdom consented to use their clinical data, including the PREM-9.

SPSS was used to analyse the change in PREM-9 total score, and individual items post PR. The change in PREM-9 was correlated with the change in other routinely collected data COPD Assessment Test (CAT), Hospital Anxiety and Depression Scale (HADS) and the Incremental Shuttle Walk Test (ISWT).

Results Data from 69 participants was analysed, 35 males, mean [SD] FEV_1 (%) 57.3% [19.6], age 66 [10.2] years. A significant mean change was noted for the PREM-9 of -3.13 (95%CI: -5.39 to -0.88). Change in individual PREM-9 questions and domains are reported in table 1.

There was a weak positive correlation between the PREM-9 questionnaire change with the change in HADS anxiety domain (r=0.35, p=0.04) and the change in CAT questionnaire (r=0.38, p=0.02). However, no significant correlation was found between the PREM-9 change and the HADS depression domain or ISWT change.

Conclusion Patients' experience of living with COPD improved after a 6-week PR programme especially in coping with their COPD every day. These changes were associated with positive changes in anxiety and symptoms. Therefore, this questionnaire provides a unique insight into the patients' experience with their care and may act as a quality indicator for benchmarking the PR service.

Ethics Number: 17/EM/0156

Abstract P69 Table 1 COPD PREM-9 results

		Pre PR Mean±[SD]	Post PR Mean±[SD]	*P* value
PREM-9	Question 1	2.79±1.5	2.05±1.49	
My everyday life	Question 2	1.4±1.53	1.5±1.25	
with COPD	Question 3	2.28±1.44	1.72±1.2	
	Question 4	1.79±1.44	1.37±1.27	
PREM-9	Question 5	2.14±1.55	1.84±1.27	
Usual care in COPD	Question 6	1.45±1.33	1.17±1.01	
	Question 7	1.64±1.3	1.02±0.87	
PREM-9	Question 8	1.93±1.32	1.67±1.44	
COPD exacerbation	Question 9	1.88±1.38	1.7±1.39	
PREM-9	Total score	17.19±9.26	14.05±7.76	.008*
HAD Anxiety	Total score	8.54±5.43	6.49±4.74	.005*
HAD Depression	Total score	6.72±3.94	5.7±4.09	.098
CAT	Total score	22.79±7.7	19.43±6.31	.003*
ISWT	Total score	291.71±149.33	338.29±158.9	.000*

*statistical difference *P*=<0.05

REFERENCES

1. Spruit., et al. An official American Thoracic Society/European Respiratory Society statement: key concepts and advances in pulmonary rehabilitation. *AJRCCM* 2013;188(8):e13-e64.
2. Hodson., *et al*. Development and first validation of a patient-reported experience measure in chronic obstructive pulmonary disease (PREM-C9). *Thorax* 2019;**74** (6):600–603.

P70 THE IMPACT OF POST COVID-19 REHABILITATION ON HOSPITAL AND NON-HOSPITALISED PARTICIPANT- IS THERE A DIFFERENCE?

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Background There is evidence that those hospitalised with COVID-19 have a significant and persistent symptom burden. Early data suggests that symptoms and functional deficit may be favourably influenced by a structured rehabilitation programme. There is little data describing the impact of a rehabilitation programme on those who had COVID-19 but were not hospitalised and managed in the community who also have persistent burdensome symptoms. We therefore wanted to explore early outcome data from rehabilitation post infection and specifically explore data from those referred from the community to our rehabilitation programme.

Methods Participants were recruited to a 6 week out-patient supervised rehabilitation programme, with sessions twice a week. The programme was developed specifically for the post COVID-19 population using educational materials from the YourCovidRecovery website. The outcomes were: the incremental shuttle walking test (ISWT) (including a familiarisation test at baseline), the endurance shuttle walking test (ESWT), COPD Assessment Test (CAT), Functional Assessment of Chronic Illness Therapy Fatigue Scale (FACIT), Hospital Anxiety and Depression Scale (HADS), EuroQual 5 domains (EQ5D) thermometer, the Montreal Cognitive Assessment (MoCA) and quadriceps maximum voluntary contraction (QMVC) (chair based strain gauge). Data was analysed using SPSS v25. A paired/independent t-test was used to compare changes before and after rehabilitation between and within groups.

Results N= 82 individuals completed the COVID-19 rehabilitation programme (45 male, mean [SD] age 58.1(16.2) years), 49 white British. 62 individuals were admitted to hospital (11.8(14.8) days) and 20 non-hospitalised. Overall the data identified significant improvements in the whole group for the ISWT, ESWT HADS (D), CAT,FACIT, QMVC

Abstract P70 Table 1

	All	Hospitalised Mean difference (SD)	Non-Hospitalised Mean difference (SD)	Between group Difference Mean difference (95% CI)
ISWT(m)	100.1(95.6)**	95.5(90.0)**	114.4(112.8)**	18.9(70.7,-32.9)
ESWT(secs)	332.0(636.9)**	308.0 (686.4)**	417.2(422.2)**	109.1 (470.0, -251.7)
QMVC (kg)	5.2(4.8)**	5.6(4.7)**	3.7(5.5)	1.9 (2.2,-6.0)
FACIT	3.8(7.8)**	3.4 (7.4)*	5.1(9.2)*	1.8 (-2.6,6.2)
CAT	2.6(6.0)**	2.8(5.6)**	0.7(7.2)	2.1 (5.4,-1.1)
EQ-5D (thermometer)	7.7(20.1)**	11.0(19.4)**	3.9(19.0)	14.9 (3.2, 26.6)*
MoCA	0.8(3.8)	0.8(4.2)	0.7(1.9)	0.08(2.2,-2.4)
HAD-A	0.6(3.1)	0.6(3.0)	0.4(3.3)	0.2 (1.5,-2.0)
HAD-D	1.1(3.5)*	1.3(3.4)*	0.5(3.8)	0.8(1.2,-2.7)

*<0.05 **<0.01

and EQ-5D thermometer ($p<0.05$). With the exception of the EQ-5D there was no significant difference in improvements between groups ($P>0.05$) (table 1). The within group changes demonstrated similar improvements in exercise capacity and the FACIT ($p<0.01$) but the non-hospital group did not reach statistical significance for other outcomes.

Conclusion Early data suggests that those who have prolonged and significant symptoms post COVID-19 improve after a supervised rehabilitation programme. The response to the intervention is similar in both hospitalised and non-hospitalised groups. This is early cohort data and therefore must be treated with caution, nevertheless is encouraging.

P71 PATIENTS WITH LONG COVID BENEFIT FROM REHABILITATION INDEPENDENTLY OF THE SEVERITY OF THE ACUTE COURSE OF THE DISEASE

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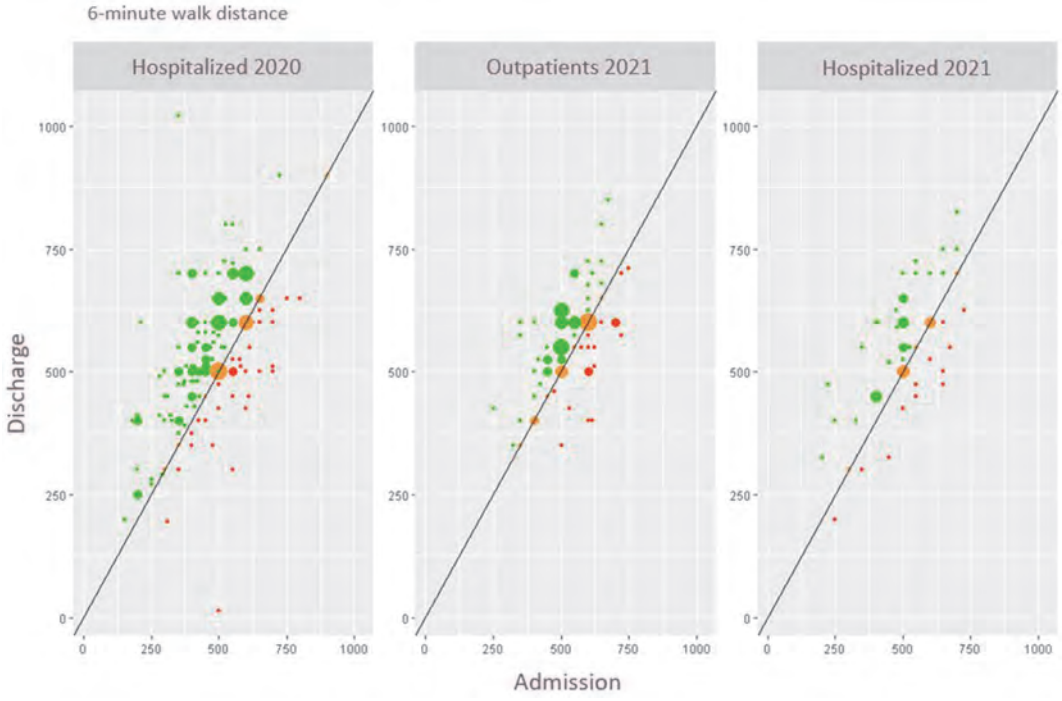
10.1136/thorax-2021-BTSabstracts.181

Background Large numbers of people suffer from symptoms that continue or develop after acute COVID-19 like reduced exercise performance, impaired lung function and psychological distress. The need of post-corona rehabilitation to reduce long-term complications is becoming a key component in the continuum of care. We measured functional outcomes of Long Covid patients in two German rehabilitation centres.

Methods Measurements at admission and discharge of the inpatient rehabilitation stay (mean duration of stay: 27) comprised 6-minute walk distance (6MWD), vital capacity (VC), PHQ-9 and GAD-7. Compared were 3 groups: 1) acute course hospitalization in 2020 (hospitalized 2020); 2) acute course hospitalization in 2021 (hospitalized 2021); 3) without hospitalization (outpatient 2021).

Results In all groups the 6MWD increased significantly during rehabilitation in the pre to post comparison with an average of +30.5 (±86.7) meters (outpatients 2021), +42.5 (±99.9) meters (hospitalized 2021) and +67.8 (±122.7) meters (hospitalized 2020). At discharge, patients in all groups improved in VC +150.3 (±350.2) ml (outpatients 2021), +157.4 (±576.8) ml (hospitalized 2021) and 111.3 (±377.3) ml (hospitalized 2020). PHQ-9 decreased significantly in the pre to post comparison with an average of -3.1 (±3.9) (outpatients 2021), -2.8 (±4.1) (hospitalized 2021) and -3.2 (±4.0) (hospitalized 2020) as well as the GAD-7 -3.3 (±3.8) (outpatients 2021), -3.0 (±3.9) (hospitalized 2021) and 3.7 (±4.2) (hospitalized 2020).



Abstract P71 Figure 1

Conclusion Inpatient rehabilitation for patients with Long Covid was associated with improvement in exercise performance, lung function and psychological parameters with and without hospitalization during the acute COVID-19 infection. Results indicate the usefulness of rehabilitation to reduce and avoid long-term consequences of a COVID-19 infection independent of the severity of the acute course of the disease.

P72 USING THE MULTIDIMENSIONAL DYSPNOEA PROFILE IN COVID-19- THE DIFFERENT SENSATIONS OF BREATHLESSNESS AND THEIR IMPACT

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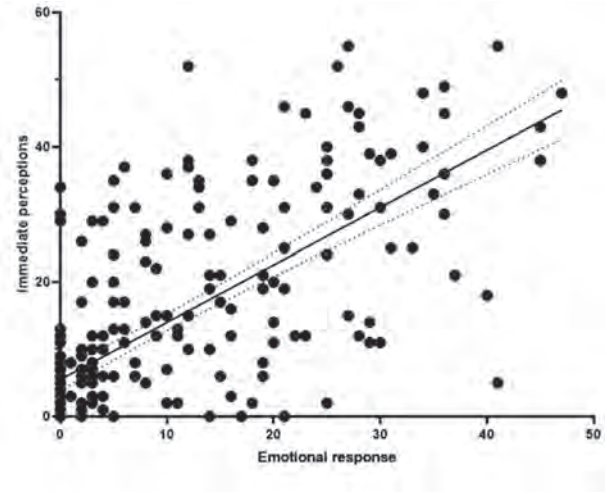
10.1136/thorax-2021-BTSabstracts.182

Introduction Patients with COVID-19 can experience breathlessness during the acute phase of the illness and as a long-term symptom following infection. Breathlessness can be a distressing symptom that manifests as a number of different sensations. The Multidimensional Dyspnoea Profile (MDP) explores different sensations of breathlessness and the emotional impact of these sensations. The aim of this study is to understand the prevalence/severity and sensations of breathlessness following COVID-19.
Methods Patients with COVID-19 who were discharged from the University Hospitals of Leicester between March 2020 and November 2020 were called as part of routine clinical follow up and invited to take part in this research. The MDP was administered over the phone by a clinician. Data was analysed in SPSS, using an independent t-test. The MDP is presented as immediate perception and emotional response (scored out of 60 and 50 respectively, higher=more severe).
Results 280 patients (mean [SD] age 57[13] years, gender n=161 (56%) male, n=155(54%) white British, 80(29%) with a pre-existing respiratory condition) completed the assessment. The mean [SD] length of stay was 10[15] days, time to follow up 47[31] days, and 25 (9%) of patients were ventilated. The mean [SD] of the MDP was 13[15] for the immediate perception and 9[11] for the emotional response (figure 1).



Abstract P72 Figure 1 Immediate and emotional domains of the Multidimensional Dyspnoea Profile

Of those reporting breathlessness (177 (63%)) mean [SD] of 20[15] in the immediate perception and 13[12] for the emotional domain. The most prevalent sensation was hyperventilation and, emotion was frustration. There were no statistically significant differences between the mean [SD] of the immediate response or emotional domain between ventilation status, and length of stay. Females reported a statistically significantly higher immediate and emotional response than males (mean [SD] difference 7[2], p=<0.01; 6[2], p<0.01 respectively). There were no significant differences in the immediate or emotional domains in those with or without a pre-existing respiratory condition (p=0.25).
Conclusion 63% of patients following COVID-19 identified at least one sensation of breathlessness that persisted after discharge. The severity and emotional response to breathlessness was not influenced by length of stay, ventilatory status during admission or pre-existing respiratory condition.

Virtually perfect: remote medicine and digital health

P73 IMPLEMENTATION OF A COMPUTER GUIDED CONSULTATION (INTELLIGENT CLINICAL DECISION SUPPORT SYSTEM SOFTWARE) IN THE LIVERPOOL SLEEP SERVICE: THE CREATION OF A DIGITAL ECOSYSTEM TO TRANSFORM PATIENT PATHWAYS

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10.1136/thorax-2021-BTSabstracts.183

Background The Liverpool Sleep Centre provides secondary/tertiary level care for a range of sleep disorders. An increasing volume of referrals and the impact of Covid threatened to overwhelm the service resulting in increasing clinical risk and decreased patient satisfaction. We describe how the use of technology addressed these challenges through the implementation of a Computer Guided Consultation system i.e. clinical decision support software (CDSS).
Methodology The CDSS is a digital ecosystem comprising multiple intelligent consultations encompassing the entire OSA pathway including Assessment and diagnosis, CPAP set up, CPAP monitoring and issuing consumables thus acting as an end to end system solution and an Electronic Patient Record. The CDSS also features a 'clinical dashboard' allowing the service to track activity, monitor RTT performance and identify high risk patients e.g. sleepy drivers, hypoventilation in 'real time'.
Results Prior to implementation of the CDSS, all suspected OSA referrals underwent a sleep study and the results of which together with the information contained in the referral letter would have been reviewed by a Consultant in a 'Virtual clinic' with treatment decisions made in such clinics. In order to meet this demand, the service required 8 clinics weekly (5 Consultant 'Virtual' clinics consisting of 20 patients each and 3 'Combined' Consultant/Physiologist clinics). Since March 1st to June 2021 following CDSS implementation, 325 patients (see table 1 for demographics) with suspected OSA were assessed by paramedical staff using the CDSS. Only 15% of these patients subsequently required a Consultant review either in a 'Virtual' or a 'Face to Face' manner (translating into just 0.5 clinics weekly), no 'combined' clinics were required with

Abstract P73 Table 1 Demographics of study population (n=325)

Age (mean SD)	49 (14)
Gender	48% female
BMI	35.9 (9.3)
AHI (valid sleep study at time of analysis in 282)	18.7 (19.6)
ESS	10.5
Diagnostic breakdown	Mild OSA (21%); Mod OSA (18%); Severe OSA (22%); Other (39%)

the 'clinical dashboard' used to highlight difficult cases for a weekly MDT. The CDSS generates automated clinical letters for each review thus greatly reducing secretarial time/costs for the service as no typing is required.

Conclusion The implementation of an intelligent Computer Guided Consultation system has resulted in pathway transformation enabling scarce Consultant resource to be channelled to where it is most required and enhancing service capacity, efficiency and patient safety. Adopting the system results in multi-level health economic benefits and facilitates greater service oversight.

Please refer to page A192 for declarations of interest related to this abstract.

P74 DIGITAL TRANSFORMATION – THE BEATING HEART OF A MODERN COPD SERVICE

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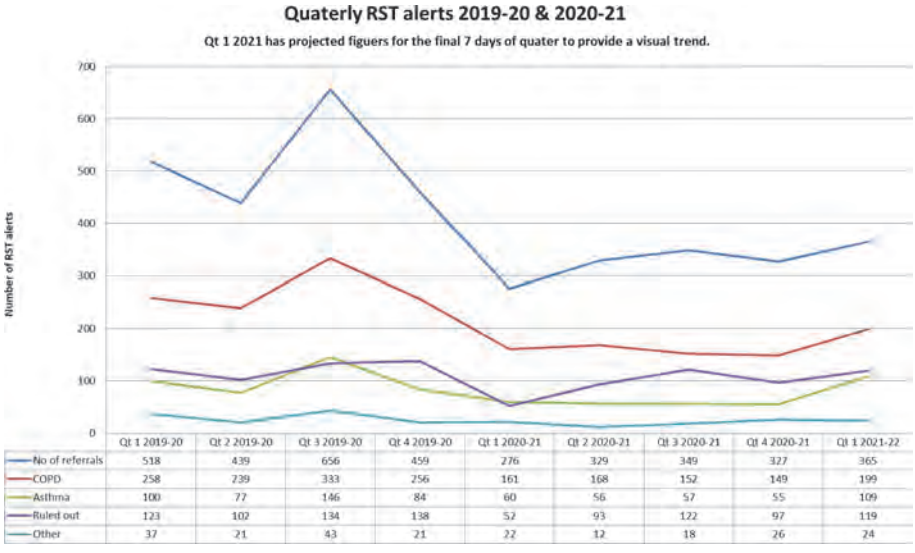
10.1136/thorax-2021-BTSabstracts.184

Introduction and Objectives We commenced an early supported discharge (ESD) service for COPD patients in March 2020. We describe the number of patients presenting to our hospital since then, our virtual in-patient multi-disciplinary team (MDT) ward-round and the benefits that this has brought to our COPD service.

Methods A pilot ESD service developed jointly between the acute hospital and community respiratory team uses co-prescription of prednisolone ≥30mg AND regular nebulised bronchodilators in our electronic prescribing information and communication system (PICS) to send an alert to the Blackberries of our specialist respiratory nursing/physiotherapy team (RST). They conduct a remote assessment to identify those patients with COPD, and attend the bedside to complete a comprehensive COPD discharge bundle. They also provide clinical advice to the in-patient medical team on prescribing, inhaler device selection, target saturations, etc, calculating an initial DECAF score, and using this with a respiratory consultant's support to identify patients for ESD.

Results and Service Description Completion of the COPD bundle generates an in-patient virtual COPD ward allowing the respiratory consultant to conduct a virtual ward-round each morning. DECAF score is finalised, suitable patients are identified for ESD, and advice about treatment, investigation and follow up are written in PICS; changes in prescriptions are made where required. The consultant and RST communicate by email and/or phone about the management of the patients providing a virtual in-patient MDT ward-round.

The virtual ward is also used to: support door-to-mask time quality improvement; to optimise run chart data entry for the National Asthma and COPD Audit Programme (NACAP; smoking cessation, oxygen prescription, spirometry results) and to populate our NACAP returns; to optimise the remainder of the COPD care bundle including antibiotic prescription, thromboprophylaxis, steroid and nebulised bronchodilator prescription, with advice about respiratory failure and ward destination using our COPD care bundle mnemonic (AECOPD-R^2D^2). The COPD bundle is sent automatically to the GP portal when the patient is discharged from hospital.



	Qt 1 2019-20	Qt 2 2019-20	Qt 3 2019-20	Qt 4 2019-20	Qt 1 2020-21	Qt 2 2020-21	Qt 3 2020-21	Qt 4 2020-21	Qt 1 2021-22
No of referrals	518	439	656	459	276	329	349	327	365
COPD	258	239	333	256	161	168	152	149	199
Asthma	100	77	146	84	60	56	57	55	109
Ruled out	123	102	134	138	52	93	122	97	119
Other	37	21	43	21	22	12	18	26	24

Abstract P74 Figure 1 Total no. of alerts (upper, blue line) and COPD alerts (second uppermost, red line) sent to RST over time – the impact of COVID on acute admissions can clearly be seen by the marked reduction in Q1 2020–2021 which also corresponds with when the pilot service started
(Asthma – RST also review patients with asthma. Ruled out = on clinical review patient had neither COPD nor asthma; Other = not reviewed by RST (short stay, self discharge or died prior to review)).

Conclusion Our ESD pilot has allowed us to develop a COPD service with IT at its heart. This has led to many improvements including a novel daily in-patient virtual MDT ward-round.

Please refer to page A192 for declarations of interest related to this abstract.

P75 A COMPARISON OF TELEPHONE VERSUS FACE-TO-FACE CONSULTATIONS WHEN COMMENCING CPAP THERAPY FOR OBSTRUCTIVE SLEEP APNOEA

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10.1136/thorax-2021-BTSabstracts.185

Background The Covid-19 pandemic has led to the cancellation of a large majority of face-to-face clinic appointments across the NHS, prompting a shift towards telephone reviews. Although perceived as being inferior in some circumstances where direct patient contact is vital for picking up on physical signs and non-verbal cues, for many areas of medicine this could increase efficiency and minimise disruption to patient's lives whilst delivering comparable outcomes.[1] In this study, we compared CPAP compliance in patients with obstructive sleep apnoea reviewed via telephone with those seen in face-to-face clinics.

Methods Forty patients who attended for CPAP set up were allocated to receive either telephone or face-to-face compliance appointments with twenty patients in each cohort. They were reviewed at 48 hours post CPAP initiation, seven days, one month and six months. At each review their apnoea-hypopnoea index (AHI) and compliance percentage was downloaded. An unpaired T-test was used to compare the two groups.

Results There were 14 males and 6 females in the telephone cohort versus 15 males and 5 females in the face-to-face cohort. The telephone group were aged 32–69 (median age 53) whereas the face-to-face group were aged 30–66 (median age 46).

The mean (SD) compliance at six months in the telephone cohort was 43.8% (36.7%), compared with 45.6% (38.5%) in the group who had had face-to-face reviews (p = 0.869). The mean (SD) AHI at six months in the telephone cohort was 3.5 (2.8), compared with 5.6 (4.5) in the face-to-face group (p = 0.057). The results show no significant difference between the two groups.

Abstract P75 Table 1 The mean (standard deviation) of CPAP compliance and apnoea-hypopnoea index in telephone and face-to-face groups at various time points

	Compliance			AHI		
	Telephone	Face-to-Face	p-value	Telephone	Face-to-Face	p-value
Initial	n/a	n/a	n/a	38.6 (19.3)	39.5 (24.3)	n/a
48 Hours	71.5% (37.0%)	61.7% (44.6%)	0.154	3.8 (3.6)	6.3 (7.8)	0.007
7 Days	58.0% (40.5%)	57.2% (40.3%)	0.840	4.7 (4.5)	5.1 (4.6)	0.661
1 Month	54.8% (36.2%)	47.5% (38.4%)	0.457	3.9 (3.0)	5.9 (4.8)	0.092
6 Months	43.8% (36.7%)	45.6% (38.5%)	0.869	3.5 (2.8)	5.6 (4.5)	0.057

Conclusion Conducting telephone consultations with patients who are being set up on CPAP was shown to be non-inferior to having face-to-face reviews. This study supports the idea that telephone reviews are a safe alternative to traditional face-to-face clinics.

REFERENCE

1. Car J, Koh GCH, Foong PS, Wang CJ. Video consultations in primary and specialist care during the covid-19 pandemic and beyond. BMJ 2020;371:m3945. doi: https://doi.org/10.1136/bmj.m3945

P76 IMPROVING COMMUNITY-BASED CARE USING ONLINE COMMUNICATION PORTAL FOR PATIENTS WITH AN INDWELLING PLEURAL CATHETER

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10.1136/thorax-2021-BTSabstracts.186

Introduction and Objectives Indwelling pleural catheter (IPC) manufacturers offer an online portal to facilitate communication between secondary care services and the district nurses (DNs).

We aimed to characterise the experiences of patients and DNs of community-based IPC care that is supported by an online communication portal.

Methods A manufacturer-based online portal was adopted by our service in February 2021 with data prospectively collected on IPC care. Qualitative feedback was sought from patients and district nursing teams during follow-up.

Results 13 eligible patients underwent IPC insertion between February 2021 and June 2021. 100% (13/13) patients agreed to be enrolled onto the portal.

Seven issues affected six patients during follow up, four of which were addressed in the community.

Four phone calls were documented regarding bottle shortages. Via the portal, overnight delivery of bottles to patient's address was organised on all occasions. DNs were also trained on fast-track bottle requisition.

In three patients, sutures were not removed as instructed, which was identified at planned hospital follow up. Via the portal, the manufacturer contacted DNs to organise refresher training. Two DN teams accessed this course and reported benefits, finding it particularly useful for their novice practitioners. The training covered all aspects of the product, drainage procedure, ordering process and troubleshooting.

All patients reported satisfaction with their community-based care during the follow up period. The four patients with bottle issues were grateful for a prompt resolution without the need to attend the hospital.

One patient reported a '*sense of confidence in the care being provided in the community.*'

Conclusion The online portal ensures seamless communication between a secondary care pleural service and the local district nursing teams, avoiding the need for healthcare attendance through prompt resolution of community-based issues. It also facilitates the provision of community-based training. The partnership between these teams ensures better care quality, clinical outcome and support for patients.

P77 OUTCOMES IN PANDEMIC ASTHMA DIAGNOSTICS WITH HOME SPIROMETRY

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10.1136/thorax-2021-BTSabstracts.187

Introduction Asthma remains diagnostically challenging, with up to one-third of patients labelled as asthmatic without supportive evidence of obstructive or reversible spirometry. The COVID-19 pandemic had a profound impact on the capacity to perform in-hospital lung function testing, leaving numerous patients with airways disease incompletely diagnosed and corticosteroid dependent. We examine the challenges to pandemic asthma diagnostics within a newly established home spirometry programme, which also aimed to facilitate prompt patient access to asthma biologic therapies.

Methods The initial cohort of adult patients enrolled into our home spirometry programme between October 2020 and January 2021 were retrospectively reviewed. Patients were identified following an outpatient virtual clinic appointment. Medical International Research (MIR) Spirobank Smart Spirometers were issued to these patients under direction of a lung physiologist, and baseline spirometry was captured. Patients were instructed to capture spirometry when symptomatic and those who demonstrated obstructive spirometry in the context of recurrent or daily prednisolone were then discussed onwards for asthma biologic eligibility. In conjunction with demographic data, patient factors affecting length of time to return spirometry data, reasons for slow or non-compliance and further consideration for biologic therapy were evaluated.

Results Patient demographics are demonstrated in table 1. The mean geographic distribution of patients was 32.2 miles away from our hospital. 92.9% of patients had prior in-lab spirometry, with a mean FEV1/FVC ratio of 0.83±0.1. Following issue of a home spirometer, 85.7% of patients engaged with measurements, with a mean of 1.8 attempts to achieve baseline reading. Patients took an average of 14.4 days to send in spirometry results. The predominant reason for slow compliance being concurrent illness. There were no spirometry manoeuvre-related or device-related adverse events. 6 (12%) of patients demonstrated obstructive spirometry and were subsequently found to be suitable for commencement of asthma biologic therapy.

Conclusions Domiciliary spirometry in a cohort of patients with a presumed diagnosis of difficult-to-treat asthma, enabled just over one in every ten patients to commence asthma biologic therapies, whilst allowing patients to limit extensive travel and remain out of the hospital environment. Further work is warranted to ensure feasibility, cost-effectiveness and patient compliance.

Abstract P77 Table 1

		n = 50	(%)
Age (years)		44	
Sex	Male	9	18
	Female	41	82
BMI (kg/m^2)		30.7	
On high dose inhaled corticosteroids (ICS)		49	98
No. of patients on at least 5mg daily prednisolone		19	38
No. of patients who had 2 or more courses of prednisolone		29	58
Ethnicity	Caucasian	39	78
	Black	1	2
	Other	10	20

P78 IMPROVING THE ACCESSIBILITY OF PEAK EXPIRATORY FLOW DURING THE COVID-19 PANDEMIC USING A PATIENT-FRIENDLY SYSTEM

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10.1136/thorax-2021-BTSabstracts.188

Introduction and Objectives Diagnostic spirometry was understandably constrained during the COVID-19 pandemic. This limitation inspired a renewed focus on utilising peak expiratory flow (PEF) as part of routine patient assessment within our asthma clinic, recognising its potential value both in the diagnostic algorithm and in assessing asthma control.

We created a paper-light system reducing the amount of paper passed between patients and healthcare staff. Patient representatives highlighted that plotting readings onto a graph could be difficult. We therefore designed a two-week PEF recording form which could be returned electronically to a designated trust email account. These results were entered into a spreadsheet to calculate average daily diurnal PEF variability.

Methods Referrals to our secondary care asthma clinic from June-September 2020 were reviewed regarding completion of their PEF diary, PEF variability and their subsequent diagnosis.

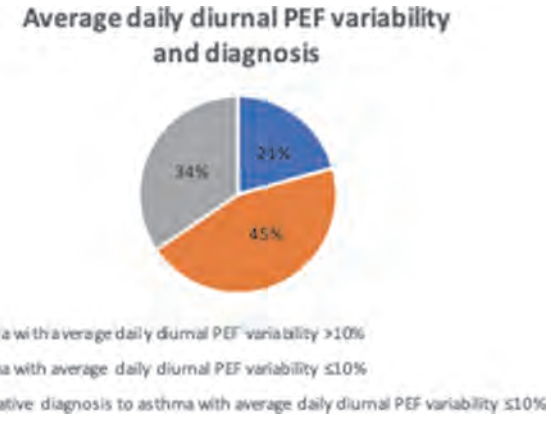
We followed GINA guidelines, accepting an average daily diurnal PEF variability of >10% as evidence of variable expiratory airflow limitation.

Results 58 patients returned their diary electronically, equating to 50% of new patient referrals seen during June-September 2020. 74% (43/58) completed 100% PEF readings, with all patients completing ≥50%. This reflects a significant increase on historical PEF diary returns.

38 of these 58 patients (65.5%) had a diagnosis of asthma confirmed, and in 12 (31.6%), the average daily diurnal PEF variability was >10% indicating persistent variable airflow obstruction.

In the 20 patients where the diagnosis of asthma was not confirmed, none showed >10% average daily diurnal PEF variability, also highlighting the value of a negative result.

Conclusion This electronic system re-vitalised the use of PEF in our asthma clinic; it is paper-light, patient-friendly and has



Abstract P78 Figure 1

increased our PEF diary responses, without additional cost or the requirement of a smart-phone. An average daily diurnal PEF variability >10% is valuable for the diagnosis of asthma and to assess asthma control. We continue to utilise PEF and have shared this resource across our local asthma networks. This is also likely to be beneficial in primary care to support annual asthma reviews and the requirement for at least two confirmatory diagnostic tests in the 2020/2021 NHS Quality and Outcomes Framework.

The real-world care of COPD patients

P79 THE CURE PROJECT: EXPERIENCE OF CARE & PERCEPTIONS IN PATIENTS THAT SMOKE ADMITTED TO HOSPITAL

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10.1136/thorax-2021-BTSabstracts.189

Introduction Smoking cessation is one of the most cost-effective interventions available to the NHS but the provision of evidenced based interventions in acute care trusts is woefully inadequate. The CURE project is an innovative acute care trust tobacco addiction treatment service. We performed an experience of care survey in current smokers admitted to hospital and offered treatment by the CURE team.

Method All inpatients identified as current smokers are automatically referred to the CURE team in an opt-out service. The CURE team attempts to visit every smoker and offer pharmacotherapy and specialist support. From 1st July 2020 to 30th August 2020 all patients visited face to face by the CURE team were offered the opportunity to complete an experience of care survey. Patients provided written consent and were asked about their smoking habits, quit attempts, their current admission, experience of the CURE service and future service developments.

Results A total of 247 patients were identified on admission to our trust in the survey period. 54% completed the survey. 28 omitted to provide written consent leaving 106 surveys for analysis. 89% stated that being admitted to hospital made them consider a quit attempt. 100% felt it was acceptable to be approached whilst in hospital in an opt-out model of care. 91% and 89% of patients accepted the offer of inpatient medication/support and discharge support respectively. 82% of patients rated the CURE service as either 9/10 or 10/10 in terms of experience of care. 65% of patients would have been interested in vaping starter kits as treatment intervention to remain smoke free if it was offered by the CURE team. 65% agreed or strongly agreed that vaping should be allowed on hospital grounds.

Conclusion This patient-led data, from an unselected population of patients that smoke admitted to hospital, confirms that a hospital admission is an important opportunity to provide tobacco addiction treatment. Furthermore, there is excellent uptake and acceptability alongside good experience of care in our comprehensive opt-out model of care. The addition of vaping kits to our treatment offer is a potential avenue to improve the impact of this service further.

P80 AMBIVALENCE OR BLIND FAITH? ATTITUDES AND EXPERIENCES IN A COMMUNITY CURE RESPIRATORY SMOKING CESSATION SERVICES

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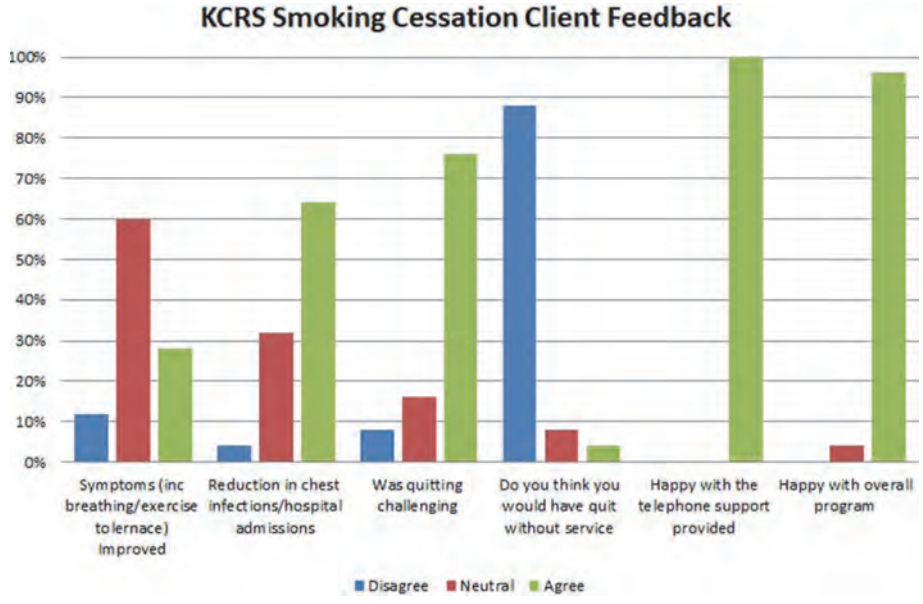
10.1136/thorax-2021-BTSabstracts.190

Introduction The UK Government has an ambition that England will be smoke-free by 2030. Smoking is the biggest reason of premature death/disability. Over 77000 people die in England from smoking annually, more than the combined deaths due to obesity, alcohol, and illegal drugs.[1]75% of 47000 cases of lung cancer in the UK are caused by smoking



Abstract P80 Figure 1 KCRS smoking cessation client feedback

every year. Ending smoking could be the greatest single contribution to increasing healthy years of life, while narrowing the gap between the rich and poor.

Background KCRS provides a pharmacist-led specialised smoking cessation service. The service was initially trialled as a pilot in 2018 after rates of smoking in Knowsley had remained static in the preceding 8 years at around 40%. Considering there was a council run Smoking Cessation service, it was felt that a more enhanced and specialised service was required to improve smoking quit rates. Following the success of the pilot, the service was commissioned by Knowsley council.

The Service The following components of the service provide:

- Access to clinical records, allowing the safe use of NRT and Varenicline
- NRT and Varenicline PGDs; allowing clients to have access to medications without delays
- In-house counsellor to address social barriers to stop smoking
- Weekly contact by smoking champions for 12 -16 weeks
- The opportunity for clients to contact the service directly for support

Data Collection and Feedback For 183 clients we supported in the last 12 months, 73 were smoke free by 4 weeks. The most satisfying aspect though was that 69 of the 73 then remained smoke free at 12 weeks. Feedback from patients was overwhelmingly positive for the service.

Discussion Aside from the data demonstrating our ability to keep clients smoke-free, we have also found excellent patient satisfaction and engagement in the service. Feedback from clients highlighted the importance of continuity of care and trust in the service. We continue to listen to clients in our aim to provide a service that is valued, respected and effective for both clients and professionals alike.

REFERENCE

1. Department of Health and Social Care. Advancing our health: prevention in the 2020s (July 2019).

P81 AN AHP-LED, QUALITY IMPROVEMENT PROJECT TO REDUCE THE HOSPITALISATION RATE OF PATIENTS WITH ACUTE EXACERBATION OF COPD

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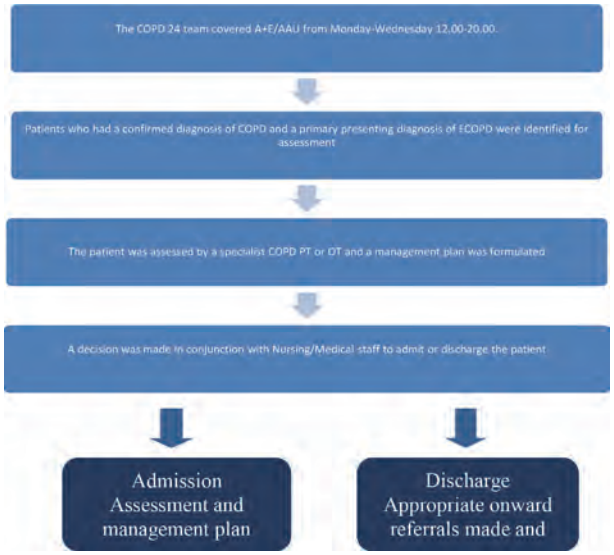
10.1136/thorax-2021-BTSabstracts.191

Introduction COPD is the second most common cause for unscheduled hospital presentation in the UK.[1] With each admission costing the NHS an average of £3,700, innovation is essential to improve patient care and healthcare service delivery.

The aims of this AHP-led intervention were: reduce admission rates to hospital for patients presenting with an acute exacerbation of COPD to ED (Emergency Department) and AAU (Acute Admissions Unit), by 20%. For those patients who did require admission to hospital, the aim was to reduce their length of stay (LOS) by 20%.

Methods A quality improvement approach was taken to the investigation, which was conducted in a large, city centre, teaching hospital with approximately 1000 beds. By sampling locally collected data a baseline discharge rate of 12% for COPD patients was established; the baseline average LOS was 8 days. We also measured readmission rate, staff and patient satisfaction.



Abstract P81 Figure 1 Flowchart detailing project intervention

The intervention delivered is shown in figure 1.

Results The project showed successful outcomes: discharge rate was 28% (an improvement of 16%) and LOS for patients admitted was on average 6 days (a 25% improvement). Patient experience was positive, with the majority rating the service as 'Excellent'. 54% staff rated the project as implemented Well or Very Well. Only one patient was readmitted within 7 days due to COPD.

These results suggest a saving of approximately 272 bed days over the 12-week period, which equates to £135, 000.

Conclusions Significant learning was gained regarding system barriers to patient discharge from acute hospital sites and the accuracy of centrally collected data on COPD patient hospital attendance, which will help inform future work.

The project demonstrates marked improvements can be achieved over short time periods by initiating Specialist AHP presence in healthcare settings traditionally staffed solely by medical and nursing staff, and potentially substantial cost savings can be achieved.

REFERENCE

1. Hunter LC, Lee RJ, Butcher I, *et al*. Patient characteristics associated with risk of first hospital admission and readmission for acute exacerbation of chronic obstructive pulmonary disease (COPD) following primary care COPD diagnosis: a cohort study using linked electronic patient records. *BMJ Open* 2016;**6**:e009121.

Please refer to page A193 for declarations of interest related to this abstract.

P82 THE REAL-WORLD USE OF AZITHROMYCIN IN PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE

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Introduction Chronic obstructive pulmonary disease (COPD) is a progressive lung disease and is the third leading cause of death in the world. The British Thoracic Society (BTS) recommends the use of azithromycin for patients who experience ≥3 ECOPDs per year, OR ≥1 severe exacerbation with

hospitalisation. This real world study aimed to determine the use of COPD patients on long-term azithromycin.

Methods This retrospective review of 42 COPD patients with a minimum of 12 months of follow up for each patient. While previous studies have shown daily use due to side effects and tolerability issues we commenced all patients on 250mg three times a week. Patients with co-existing asthma, bronchiectasis, with non-tuberculosis bacteria, on nebulised antibiotics were excluded.

Results and Discussion 42 patients (19 males, 23 females), 8 ex-smokers, 24 smokers, 1 non-smoker and 9 unclassified. The mean age of 74 years (59–97) and mean BMI of 31.3. 10 of these patients were immunosuppressed and dose of azithromycin prescribed to patients was 250mg three times a week (97%) and 500mg three times a week (4%). 47.6% (20) had to discontinue azithromycin use to various reasons.

The average infections in the pre-treatment group was 7 (±2.77) versus 2 (± 1.94) in the subsequent 12 months with a statistically significance ($p<0.05$), and a decrease in difference was seen in the number of hospitalisations. 14 (33%) patients saw a 100% reduction in the infection rate following azithromycin use. As this was a retrospective study, the number of infections depended on reporting from the patient and may be influenced by recall bias.

Conclusion The number of infective exacerbations was significantly decreased with the introduction of azithromycin therapy. It is important that an ECG to measure QT changes before and after commencing therapy to monitor the harmful effects of the macrolide. Hearing loss is the major side effect faced by patients, and this must be stressed to patients as it happens more frequently than originally thought. The dosage of 250mg three times a week seems to be work as well as daily azithromycin as suggested in the subsequent BTS guideline 2020.

P83 CHRONIC OBSTRUCTIVE PULMONARY DISEASE – OBSTRUCTIVE SLEEP APNOEA OVERLAP SYNDROME MANAGEMENT – A NATIONAL SURVEY

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Introduction When chronic obstructive pulmonary disease (COPD) and obstructive sleep apnoea syndrome (OSA) occur together it is known as the COPD-OSA Overlap Syndrome. Studies show a prevalence of 1–4% but as high as 66% in people with moderate-severe COPD. As it is not routine practice to screen COPD patients for OSA, it is likely underdiagnosed. Expert opinion suggests those with severe hypercapnia should be considered for non-invasive ventilation (NIV) and those without for continuous positive airway pressure (CPAP). This is based upon existing randomised controlled trials (RCT) in COPD and obesity hypoventilation. There are no RCTs to determine the clinical efficacy of CPAP in comparison to NIV in COPD-OSA. The aim of this study was to gauge current national practice via an electronic survey.

Methods An electronic survey was sent via national email networks to assess respondents management of COPD-OSA. This contained case vignettes with varying severities of OSA, COPD, hypercapnia and the presence or absence of a history of acute hypercapnic respiratory failure (AHRF).

Results There were 88 survey respondents, from 40 institutions. 74% were Doctors, 11% Nurse Specialists/Consultants, 3% Physiotherapists and 3% Clinical Scientists. Only 8% reported their COPD service routinely screened all patients for OSA. In the clinical vignettes with a PaCO2 below <7kPa, most respondents selected CPAP as first line therapy: Case 1 = 91% (PaCO2 6.2), Case 3 = 80% (PaCO2 6.7). Case 4 had a history of AHRF and 84% selected NIV as first line treatment. In cases 2 and 5 the PaCO2 was >7 kPa and there was no history of AHRF. In these cases, there was clinical equipoise. In case 2: 69% selected NIV and 26% CPAP. In case 5: 48% selected CPAP and 52% NIV.

Conclusions Our study shows that in patients with COPD-OSA with a PaCO2 below 7 kPa, most respondents would treat with CPAP first line. However, in those patients with no history of AHRF who have a PaCO2 >7 kPa, there was clinical equipoise amongst NHS specialists with regards to first line therapy. There are currently no RCTs in this area and further research is required.

P84 IDENTIFYING CHRONIC OBSTRUCTIVE PULMONARY DISEASE – OBSTRUCTIVE SLEEP APNOEA OVERLAP SYNDROME – DOES IT MATTER?

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Introduction The prevalence of Chronic Obstructive Pulmonary Disease - Obstructive Sleep Apnoea Overlap Syndrome (COPD-OSA) is 1–4% in the general population but is higher in those with severe airways obstruction. It has a higher rate of hospitalisation, exacerbation frequency and mortality than in either condition alone, yet there are no randomised control trials (RCT) to guide management. Our aim was to assess the prevalence of obesity and OSA within a COPD home ventilation cohort as we hypothesise that COPD-OSA is under recognised.

Methods A retrospective analysis was performed of active patients in a regional Home Ventilation Service. 221 patients were identified who were initiated on non-invasive ventilation (NIV) between 2009–2021 and whose documented cause of respiratory failure was COPD. Using electronic healthcare records, we collected the body mass index (BMI), diagnosis of OSA, PaCO2 at time of referral and route of referral.

Results 217 patients had a BMI recorded; in 50% it was ≥30 and 24% ≥40. 28% had diagnosed OSA but in those with a BMI of ≥30, 49% had OSA (table 1). 53% of those with OSA had a previous trial of continuous positive airway pressure (CPAP). 58% of referrals were made as outpatients. None had a documented formal diagnosis of 'COPD-OSA Overlap Syndrome'.

Abstract P84 Table 1 Prevalence of OSA within BMI ranges

BMI	<18.5 (n=24)	18.5 - 24.9 (n=44)	25 - 29.9 (n=40)	30 - 34.9 (n=33)	35 - 39.9 (n=25)	≥ 40 (n=51)
OSA Prevalence	4.2%	2.3%	12.5%	33.3%	48.0%	58%

Conclusion 50% of COPD patients requiring home ventilation were obese and 28% had diagnosed OSA. Although this study was a retrospective electronic record review, it suggests COPD-OSA Overlap Syndrome is common and underrecognised. OSA and COPD alone have RCT evidence supporting CPAP and NIV therapy; there is none in COPD-OSA. Given the high prevalence and mortality, it needs greater recognition as a discrete disease entity and urgent RCTs to establish optimum therapy, CPAP or NIV. Currently there is national variation in treatment based upon expert opinion and clinical availability. Yet there are significant cost differences and possibly different treatment efficacies. The majority of patients had NIV initiated in the outpatient setting, suggesting there would be time to arrange sleep studies to establish the COPD-OSA diagnosis prior to CPAP or NIV initiation. Given the high prevalence, should we be screening this high-risk cohort?

P85 RESPIRATORY DEPRESSION IN OPIOID DEPENDENT CHRONIC OBSTRUCTIVE PULMONARY DISEASE PATIENTS

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10.1136/thorax-2021-BTSabstracts.195

Introduction In the UK, opioid-related deaths are at record numbers after continually increasing year-on-year (ONS, 2019). This increase is believed to be driven by an ageing cohort of people with Opioid Use Disorder (OUD) and a high prevalence of comorbidities including chronic obstructive pulmonary disease (COPD). Our previous findings suggest that the degree of acute opioid-induced respiratory depression is greatest in OUD patients with chronically-suppressed neural respiratory drive (NRD) as a consequence of drug misuse (Jolley et al.,2015). We investigated the severity of respiratory depression in OUD and tested whether OUD exhibit more severe respiratory depression than matched controls.

Methods A convenience sample of opioid addicts receiving treatment at a community Drug & Alcohol Treatment Centre were recruited: OUD with normal lung function (OUD) and OUD with comorbid COPD (OUD-LD). OUD groups were matched with healthy controls (HC) and COPD patients with no history of drug/alcohol addiction (LD-Controls) from our laboratory database.

SpO_2%, end-tidal CO_2 ($ETCO_2$), transcutaneous CO_2 ($TcCO_2$), respiratory airflow and NRD index (NRDI), quantified using second intercostal space parasternal muscle electromyography (EMG_{para}), were measured continuously over 40mins at rest. Significant respiratory depression was defined as: SpO_2%<90% for >10s, $ETCO_2$ per breath >6.5kPa, $TcCO_2$ overall mean >6.5kPa, respiratory pauses (absence of inspiratory airflow) >10s.

Results Seven OUD patients (5M/2F, age: 48(46–52), FEV_1% pred(%): 96.1(90.5–96.5), FEV%FVC(%): 74.7(71.9–76.8)), 13 OUD-LD (11M/2F, age: 49(42–55), FEV_1%pred(%): 77.1 (66.8–90.1), FEV%FVC(%): 60.2(48.7–64.3)), 7 HC (6M/1F, age: 50(45–57), FEV_1%pred(%): 100(97.5–110.3), FEV%FVC

Abstract P85 Table 1 Presence of respiratory depression criteria in all participants with OUD and their corresponding control groups. Fisher's exact test was used to test for differences between criteria, both groups showed significant differences. OUD without LD and healthy controls p=0.021, and OUD-LD and LD-controls p=0.0001. [1]participants took OST medication on the day of testing. OUD: Opioid Use Disorder; LD: Lung Disease; SpO_2: pulse oximetry; $ETCO_2$: end-tidal CO_2; $TcCO_2$: transcutaneous CO_2.

Number	SpO_2 <90% >10s	$ETCO_2$ breaths >6.6kPa	$TcCO_2$ >6kPa mean	Resp Pauses >10s	Number	SpO_2 <90% >10s	$ETCO_2$ breaths >6.6kPa	$TcCO_2$ >6kPa mean	Resp Pauses >10s
OUD without LD:					**Healthy controls:**				
1		✓		✓	1		✓		
2[1]		✓	✓	✓	2		✓		
5	✓			✓	3				
8			✓	✓	4				
9		✓	✓		5				
16		✓			6				
18[1]		✓		✓	7				
OUD-LD:					**LD-controls:**				
3[1]			✓		1				
4[1]		✓			2				
6[1]	✓	✓		✓	3				
7[1]			✓		4				
10[1]	✓		✓		5				
11	✓	✓		✓	6				
12		✓			7				
13		✓			8				
14	✓	✓	✓	✓	9		✓		
15[1]				✓	10		✓		
17		✓	✓	✓	11				
19		✓		✓	12				
20		✓			13				

(%): 75(69.7–78.5)) and 13 LD-Controls (10M/3F, age: 66 (62–72), FEV_1%pred(%): 60(52.8–74.5), FEV%FVC(%): 52 (45–57)) were studied. At least one of the respiratory depression indicators was detected in all 20 participants with OUD (Table1). Overall, there was a greater frequency of significant respiratory depression in both OUD groups compared to controls, most commonly $ETCO_2$>6.5kPa (p=0.021;Table1). NRDI was significantly higher in LD-Controls than OUD-LD (217(43.7–504.5) min^{-1} and 148.5 (35–172.6) min^{-1}, respectively (p<0.01)), but there was no significant difference between OUD and HC (87.6(51.7–115.3) min^{-1} and 76.9 (52.8–164.2) min^{-1}, respectively (p=0.7)).

Conclusions Respiratory depression is frequently present in OUD patients with comorbid COPD and significantly more severe than in opioid-naïve controls. Further studies are required to determine the association between respiratory depression and overdose risk.

Please refer to page A193 for declarations of interest related to this abstract.

COVID-19: clinical features and risk

P86 CHARACTERISING ANOSMIA IN HOSPITALISED PATIENTS WITH COVID-19

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10.1136/thorax-2021-BTSabstracts.196

Introduction Anosmia is one of the core symptoms of COVID-19, but its significance in hospitalised patients has not been extensively studied.

Aims Our aim was to characterise anosmia experienced by hospitalised COVID-19 patients, assessing whether subjective reporting correlated with examination findings which were quantified using our novel scoring system. We also looked to explore possible association between severity of anosmia and clinical outcomes, as well as whether severity correlated with comorbidities.

Method Over a two-month period we combined reported history of anosmia with olfactory nerve examination when assessing patients hospitalised with COVID-19. Examination included scoring patients on their ability to recognise distinctive smells of coffee, vinegar, clove, vanilla and mint from disguised bottles. A numerical grading system was established scoring severity of anosmia for each smell, with a total score calculated for each patient (table 1). Co-morbidities of all patients were noted and all were followed up at discharge to monitor whether they were admitted to intensive care (ICU) and whether they developed complications of COVID-19.

Results 46 patients were included, 33 (72%) of whom were male. Examinations were either performed at admission in the Emergency Department or on medical wards shortly afterwards. 16 (35%) patients were later admitted to intensive care. Mean length of stay was 21 days (SD 18.8). Coffee was the smell most often identified with a mean score of 1.09 (SD 1.13). Vinegar was least identified with a mean score of 1.8 (SD 0.89). There was a significant difference in patients' reporting of anosmia symptoms, compared to our objective assessment. 96% of patients (30 of 31) who reported no anosmia actually had objective evidence of anosmia on examination (test of proportion, p<0.001). Severity of anosmia was not significantly associated with upper respiratory tract symptoms, ICU admission or development of complications from COVID-19. There was no correlation between severity of anosmia and presence of pre-existing comorbidities.

Abstract P86 Table 1 Anosmia scoring system developed

Score for each smell	Meaning
0	Able to identify the smell correctly
1	Able to identify the smell but it doesn't smell right
2	Unable to identify the smell
3	Total anosmia
Total scores per patient	**Definition**
0–4	Mild anosmia
5–10	Moderate anosmia
11–15	Severe anosmia

Conclusion A significant proportion of patients studied were not aware they had anosmia. This has implications for pandemic management going forward when people are required to self-report this symptom and suggests potential benefit in formal examination of the olfactory nerve.

P87 CLINICAL CHARACTERISTICS OF COVID-19 PATIENTS WITH PULMONARY EMBOLISM IN 1ST AND 2ND WAVES

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Introduction and Objectives Multiple studies have demonstrated increased risk of pulmonary embolism (PE) in COVID-19. Our study at a major NHS Trust examined the clinical characteristics, attributes and outcomes of PE in COVID-19, which have infrequently been explored in literature.

Methods We performed a retrospective cohort study of COVID-19 patients with PE diagnosed on CT pulmonary angiogram (CTPA) over 2 months in 1st and 2nd waves (April 2020 and January 2021). Data collected from electronic health and imaging records included patient demographics, D-dimers, oxygen requirements, clinical outcomes, thromboprophylaxis/treatment and PE attributes on CTPA.

Results We identified 76 COVID-19 patients with PE (mean age 62.2 years, 69.7% male, 40.8% Caucasian). Patients experienced prolonged periods of COVID-19 symptoms prior to PE diagnosis - 19.6 day symptoms in 1st wave (n = 16, 21.9%) compared to 15.2 days in 2nd wave (n = 57, 78.1%). Average D-dimer was highly elevated (mean = 11576 ng/mL). 43 (56.5%) patients had high oxygen requirements - 21 (27.6%) required ≥10 litres/min via mask, 13 (17.1%) required non-invasive ventilation and 9 (11.8%) were intubated and ventilated. 22 patients (28.9%) were admitted to intensive care and 11 patients (14.5%) died. On admission, 48 patients (63.2%) were started on treatment dose enoxaparin (high PE suspicion) and 12 (15.8%) had intermediate (prophylactic) dose enoxaparin. PEs were largely treated with 3–6 months of rivaroxaban (n = 43, 56.6%) or apixaban (n = 7, 9.2%). 65.5% (n = 49) of patients had bilateral PEs; largest sizes being segmental (n = 32, 42.1%), subsegmental (n = 17, 22.4%), lobar (n = 16, 21.1%), main pulmonary artery (n= 5, 6.6%) and saddle (n = 5, 6.6%). 15 patients (19.7%) had evidence of right heart strain on CTPA.

Conclusions Our study suggests that PE in COVID-19 is more common in males and in those with COVID symptoms greater than 2 weeks, high oxygen requirements and highly elevated D-dimers. There should be a low threshold for investigating such patients for PE. Moreover, we found COVID-19 patients with PE have high likelihood of having a bilateral pulmonary distribution with right heart strain.

P88 INITIAL ROUTINE LABORATORY TESTS CAN BE USED TO PREDICT CLINICAL COURSE IN PATIENTS HOSPITALISED WITH COVID-19

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10.1136/thorax-2021-BTSabstracts.198

Background Previous work has related demographic and clinical characteristics to clinical course and outcome of patients hospitalised with COVID-19.[1] We sought to evaluate if initial routine laboratory test results could be utilised to predict length of inpatient stay (LOS), need for non-invasive (NIV)/ invasive mechanical ventilation (IMV) and admission to an intensive care unit (ICU). We also sought to establish if C-reactive protein levels related to radiographic disease severity.
Methods A retrospective analysis was carried out on a cohort of 567 patients with a laboratory confirmed diagnosis of COVID-19 admitted during the second wave of the pandemic between April 2020 and May 2021 including descriptive statistics and multivariate and regression analysis. Radiological severity was based upon previously proposed scoring systems.[2]
Results Of the 567 patients included, 342 (60%) were male, mean age 61 years, 318 (56%) were Caucasian, 143 (25%) Asian and 35 (6%) Black. Raised admission d-dimer and urea levels correlated with longer LOS (r= 0.17 and 0.16 respectively, $p<0.01$). Rising C-reactive protein and d-dimer correlated with increased risk of requirement for admission to ICU (r= 0.27 and 0.19 respectively, $p<0.001$), need for NIV (Pearson's correlation 0.26 and 0.15 respectively, $P<0.01$) and progression to IMV (r=0.15 and 0.14, $p<0.05$). A correlation between initial routine blood results and death was not detected. C-reactive protein correlated with radiographic disease severity (r=0.32, $p<0.001$).
Conclusions Abnormalities in initial laboratory test results may be utilised to risk stratify patients presenting to secondary and tertiary care with COVID-19, may help predict clinical course and in doing so facilitate more efficient and streamlined delivery of care and resource utilisation with likely significant impact on patient outcomes.

REFERENCES

1. Cheng D, Calderwood C, Skyllberg E, et al. Clinical characteristics and outcomes of adult patients admitted with COVID-19 in East London: a retrospective cohort analysis. *BMJ Open Respiratory Research* 2021;8:e000813.
2. Monaco CG, Zaottini F, Schiaffino S, et al. Chest x-ray severity score in COVID-19 patients on emergency department admission: a two-centre study. *Eur Radiol Exp*. 2020;4(1):68.

P89 VITAMIN D DEFICIENCY INCREASES SUSCEPTIBILITY TO COVID-19 INFECTION

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10.1136/thorax-2021-BTSabstracts.199

Background Vitamin D plays a vital part in modulating the immune system, with Vitamin D deficiency leading to increased susceptibility to infection.[1] There is some evidence to suggest Vitamin D may play a protective role in the prevention of COVID-19 infection in hospitalised patients,[2] but the topic remains controversial. Our study aims to investigate if low Vitamin D levels correlate with increased risk of COVID-19 infection, thereby representing a modifiable risk factor for COVID-19 infection.
Method A retrospective observational study was conducted on 3198 health care workers of a Greater London District General Hospital, who had undergone testing for 25-OH Vitamin D levels and COVID-19 antibody in June 2020. In accordance with NICE guidelines, Vitamin D deficiency was defined as less than 25 nmol/L, insufficiency as 25–50 nmol/L, and those with levels over 50 nmol/L were used as control comparisons. Evidence of previous SARS-CoV-2 infection was assessed by detection of SARS-CoV-2 IgG antibodies. Regression analysis was performed to determine independent significance, accounting for age and gender.
Results 3191 participants were included in this study, with age ranging from 19–78 years (mean 42.9) of which 78.2% were female. Both age and gender were not independently associated with positive SARS-CoV-2 IgG antibodies. 1997 (62.6%) participants had Vitamin D levels within the normal range, 899 (28.2%) participants had insufficient levels and 302 (9.4%) had Vitamin D deficiency. Both Vitamin D deficiency (OR 1.61, p=0.002) and insufficiency (OR 1.33, p=0.006) independently correlated with significantly increased incidence of positive COVID-19 antibodies than personnel with normal Vitamin D levels.
Conclusions We report the largest single-centre study investigating the impact of low Vitamin D levels within healthcare workers to date. Significant correlation between low levels of Vitamin D and previous COVID-19 infection was identified. Oral Vitamin D supplementation to maintain levels >50 nmol/L may play a protective role against COVID-19. Larger studies are needed to investigate the role of Vitamin D supplementation in healthcare workers for further COVID-19 waves.

REFERENCES

1. Aranow C, *et al*. *Journal of Investigative Medicine* 2011;**59**:881–886.
2. Nogues X, *et al*. *J Clin Endocrinol Metab*. 2021 Jun **7**:dgab405.

P90 USE OF PROCALCITONIN TO PREDICT MORBIDITY AND MORTALITY IN COVID-19

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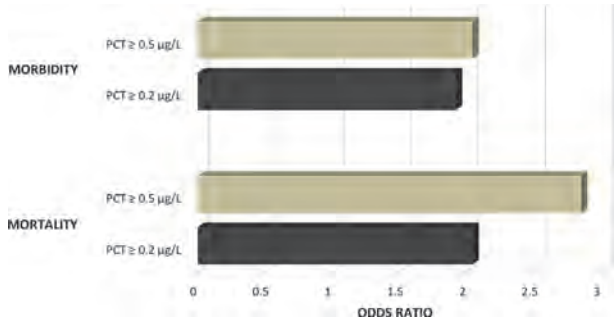
Background Procalcitonin (PCT) is an established biomarker of acute bacterial infection, and elevated levels of PCT may correlate with increased severity in patients with COVID-19 infection.[1] Here, we assess if initial PCT levels are a viable prognostic marker to predict significant morbidity and mortality outcomes for hospitalised patients admitted due to COVID-19 infection.
Method We performed retrospective analysis of initial blood results taken from 1189 patients with RT-PCR positive COVID-19 infection presenting to our District General



Abstract P90 Figure 1 The association of PCT in COVID-19 and patient morbidity and mortality.

Hospital between 1st November 2020 and 28th February 2021. Mortality encompassed both inpatient and within 28 days post-discharge. Significant morbidity was defined as admission to the Intensive Care Unit (ICU) for organ support. PCT was measured using Brahm's chemiluminescent micro particle assay (CMIA). Elevated PCT was defined at two levels: PCT ≥0.5µg/L and PCT ≥0.2µg/L, to account for variance amongst literature.[2] Regression analysis was performed to determine independent significance, accounting for comorbidity and demographics.

Results We found elevated PCT levels conferred a significant two-fold increase in mortality and ICU admission. Initial PCT ≥0.5µg/L was associated with a significantly increased risk of mortality than those with PCT <0.5µg/L (46.5% vs 24.2%; OR 2.847, p=0.0001). Significantly higher mortality risk was also observed when using lower cut-off values, i.e, PCT ≥0.2µg/L vs PCT <0.2µg/L (OR 2.042, p=0.00001). A significantly higher rate of ICU admission for initial PCT ≥0.5µg/L (OR 2.041, p=0.007) or PCT ≥0.2µg/L (OR 1.918, p=0.0008) was also observed within our cohort.

Conclusions Here, we report the largest single-centre study to date in analysing a UK-based population for procalcitonin in COVID-19. We observed a significant correlation between elevated initial levels of PCT and incidence of ICU admission and mortality within our cohort, thereby demonstrating promise for PCT as an effective prognostic marker. Using a higher cut-off for PCT ≥0.5µg/L increased mortality by almost 50%, but had no effect on morbidity. We suggest that a lower universal cut-off point for PCT should be used for detecting secondary bacterial infections and procalcitonin-guided antimicrobial therapy.

REFERENCES

1. Hu R, *et al*. *International Journal of Antimicrobial Agents* 2020;**56**(2):106051.
2. Vazzana N, *et al*. *Acta Clin Belg*. 2020 Sep **23**:1–5.

P91 IMPACT OF BACTERIAL INFECTIONS IN PATIENTS WITH COVID-19 ON MORBIDITY AND MORTALITY DURING THE SECOND UK SARS-COV-2 WAVE

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10.1136/thorax-2021-BTSabstracts.201

Background Bacterial infection has previously been observed in only 8% of COVID-19 patients,[1] yet antibiotics are administered to 85% of inpatients. Typically, Gram negative organisms and Staphylococcus aureus are isolated as responsible pathogens.[2] Here, we investigate the rates of bacterial infection during the second UK COVID-19 wave, its sources, the responsible organisms, and its impact on morbidity and mortality.

Methods 1342 RT-PCR positive COVID-19 patients admitted to a Greater London District General Hospital between 1st November 2020 and 28th February 2021 were retrospectively analysed (44.6% female; mean age 68.8; mortality 26.9%). Mortality encompassed hospitalised patients and those up to 28 days post-discharge. Morbidity was assessed by length-of-stay and need for intensive care. Positive cultures due to contaminants were excluded. Independent correlation was assessed with multilinear regression analysis adjusting for demographics and comorbidities.

Results 226 patients (16.8%) with COVID-19 had ≥1 bacterial infection. These patients possessed significantly higher independent mortality (35.0% vs. 25.3%, p<0.009), more frequently required intensive care support (19.5% vs 10.6%, p<0.00004), and required longer inpatient spells (19.6 days vs 9.46 days, p<0.0001). Greater number of positive culture types cumulatively increased mean length-of-stay (OR 9.08, p<0.00001); ≥2 culture type positivity (n=44) related to 31.5 days; ≥3 culture type positivity (n=12) 46.0 days. There was significantly higher mortality rate in patients receiving ≥1 antibiotic (30.2%) compared to no antibiotics (6.4%, p<0.00001).

Conclusion Bacterial infection is observed far more frequently in COVID-19 patients than previously reported and adversely affects morbidity and mortality. Multiple sites of bacterial infection prolongs inpatient stay and increases mortality. Thorough culture collection should be encouraged in COVID-19 patients with biochemical evidence of bacterial infection to identify responsible pathogens and respective antimicrobial sensitivity. Given the higher mortality rates, empirical use of antibiotics in COVID-19 patients without supporting evidence of bacterial infection is strongly discouraged.

REFERENCES

1. Lansbury, *et al*. *J Infect*. 2020 Aug;**81**(2):266–2.
2. Russell C, et al. *Lancet Microbe*. 2021 Jun 2. https://doi.org/10.1016/S2666-5247(21)00090-2

Abstract P91 Table 1 **(a)** Most frequently observed bacterial species **(b)** Culture type positivity with relation to rates of mortality

(a) Bacteria	Number isolated	(b) Culture Type	Number of positives	Number of deaths	Positivity mortality
Enterococcus	67	**Urine**	104	28	26.9%
Escherichia	65	**Blood**	76	28	36.8%
Staphylococcus	64	**Skin**	40	16	40%
Pseudomonas	24	**Sputum & BAL**	33	20	60.6%
Klebsiella	12	**Stool**	13	5	38.5%
Streptococcus	12	**Central venous line**	8	4	50%

P92 WHAT IS THE BURDEN OF ASPERGILLOSIS AND OTHER OPPORTUNISTIC FUNGAL INFECTIONS IN PATIENTS WITH SEVERE INFLUENZA AND COVID-19 IN THE ICU?

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Background Co-infection with Aspergillus previously described to cause significant morbidity and mortality in those with severe Influenza, has more recently been described in COVID-19. 'Influenza-Associated Pulmonary Aspergillosis' (IAPA) and 'COVID-Associated Pulmonary Aspergillosis' (CAPA) have been reported in up to 23% and 35% of severe disease, respectively. Establishing evidence of invasive Aspergillosis (IA) in these patients is challenging, requiring specific clinical, radiological and microbiological criteria. The burden of IAPA and CAPA in the ICU in our region is unknown.
Aims To identify the incidence of invasive Aspergillosis (IA) and other opportunistic fungal infection in those with severe Influenza and COVID-19 in a district general hospital, Fife, Scotland.
Methods Retrospective cohort review of ICU admissions with severe Influenza or COVID-19 from May 2017 - February 2021. IA was diagnosed using international definitions according to EORTC/MSG, AspICU and modified AspICU criteria.
Results 89 patients were identified with Influenza (27; median age 53.3 yrs, male 56%) and COVID-19 (62; median age 59.1 yrs, male 61%). No case satisfied criteria for definite IA, however, the majority of patients did not undergo all relevant tests; CT imaging features in 26/89 (29.2%), and fungal biomarkers in 3/89 (3.4%). Two patients demonstrated Aspergillus culture from respiratory samples but did not meet other criteria. Fungal infections were identified in 39/89 (44%), the majority Candida (37), mostly from ET secretions (54%). Candida was significantly higher in COVID-19 than in Influenza, including 2 patients with Candidaemia. Positive fungal culture was associated with increased length of stay (43d vs 20d), ICU bed days (26d vs 19d), but not mortality (33.3% vs 30.0%). Few patients (7.9%) received antifungal treatment, with possible explanations including unclear diagnosis, high costs, uncertain benefit. 54/89 (60.7%) demonstrated bacterial co-infection, including 31/89 (34.8%) with bacteraemia (COVID, 23; Influenza, 8).
Conclusions IAPA and CAPA were not identified in this 4-year cohort, although case finding was limited by inadequate diagnostics. Timely access to fungal biomarkers compromises diagnostic testing. The incidence is likely to be low, despite the significant study limitations. We recommend prospective systematic practice of investigations and improved fungal diagnostics to better understand the burden of Aspergillosis in these patients.

P93 COMPARISON OF INFLAMMATORY PROFILES BETWEEN COVID-19 AND OTHER ACUTE LOWER RESPIRATORY TRACT INFECTIONS: RESULTS FROM THE PREDICT-COVID19 STUDY

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Introduction COVID-19 has been reported to induce a 'cytokine storm' distinct from other acute respiratory tract infections (LRTIs). Understanding the similarities and differences in inflammatory profiles between SARS-CoV-2 infection and other respiratory infections may aid diagnosis, as well as the potential to repurpose therapies such as steroids and anti-IL-6 receptor antagonists for other respiratory infections.
Methods A prospective observational study of patients in 3 groups 1) PCR confirmed SARS-CoV-2 infection, 2) community-acquired pneumonia (CAP) without SARS-CoV-2, and 3) controls hospitalized for reasons other than infection. Patients were enrolled from a single centre in Dundee, UK. Patients were enrolled within 96 hours of hospital admission. 45 inflammatory biomarkers were measured in blood using the Olink target proteomic based biomarker panel. Additional markers were measured by ELISA/immunoassay and enzyme activity assay as appropriate. Discrimination between groups was evaluated using the area under the receiver operator characteristic curve (AUC).
Results 294 patients were included (COVID-19 n=176, CAP n=76, controls n=42), mean age 64 (SD±15.2) and 150 subjects were male (51.0%). Using ROC analysis the most discriminating biomarkers for COVID-19 compared to CAP were CXCL-10 (AUC 0.84 95%CI 0.78–0.90 p<0.001), CCL-8 (0.87 95%CI 0.82–0.92, p<0.001), CCL-7 (0.84 95%CI 0.78–0.89, p<0.001), CXCL-11 (0.80 95%CI 0.73–0.88, p<0.001). Further biomarkers included IL-18, IL-7, IL-10 and IL-33. The most discriminating biomarkers for COVID-19 compared to controls were CXCL-10 (0.89 95%CI 0.85–0.93, p<0.001, CCL-7 (0.88 95%CI 0.83–0.92, p<0.001), CCL-8 (0.87 95%CI 0.82–0.92, p<0.001). Further biomarkers included IL-10, CXCL-11 and IL-18. IL-4 was significantly lower in COVID-19 patients compared to controls (0.27 95% CI 0.16–0.38, p<0.001). No significant difference in IL-6 was seen between COVID-19 and CAP (median 21.9pg/ml vs 19.8pg/ml,p=0.59).
Conclusion Differential markers of inflammation were identified between COVID-19, CAP and control samples, indicating distinct immunological pathways. The identification of a similar IL-6 signature between COVID-19 and CAP indicates that IL-6 targeting therapies currently being used to treat COIVD-19 may also be beneficial in the treatment of CAP.

P94 INFLUENZA AND COVID-19 PNEUMONIA: THE DIFFERENCE IS PULMONARY HYPERTENSION

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Purpose To describe the incidence of pulmonary artery thrombosis in COVID-19 versus influenza pneumonia using CT angiography and to assess whether it may increase the risk of pulmonary hypertension.
Materials and Methods Single and dual energy CT pulmonary angiography of age- and gender-matched patients with influenza and COVID-19 pneumonia, referred for extra-corporeal membrane oxygenation (ECMO) and/or mechanical ventilation from January 2016 to January 2021, were retrospectively evaluated. Two independent observers qualitatively and quantitively assessed clot burden and Qanadli CT Obstruction Index. Two consensus observers calculated pulmonary artery volume

and right to left ventricular diameter ratio (Terarecon, California, USA) to diagnose pulmonary hypertension. Pulmonary infarct volume and perfused blood volume relative enhancement were also calculated (Syngo via, Siemens Healthineers, Forchheim, Germany). All radiologic parameters were correlated with clinical data. To assess if *in situ* thrombosis could be visualised on CT, isolated segmental and subsegmental filling defects were used as an imaging surrogate. For statistical analyses, Graphpad Prism9 and IBM SPSS v27.0 software were used.

Results The incidence of either central PE or DVT was equal between patients with COVID-19 and influenza pneumonia (20%). The incidence of isolated segmental and subsegmental filling defects was higher in COVID-19 but without statistical significance (44% vs 32%; p=0.5607). Right to left ventricular diameter and pulmonary artery to aorta ratios were higher in COVID-19 compared to influenza (1.01 vs 0.866 and 1.04 vs 0.904; p=0.0071 and p=0.0023, respectively).

Conclusion In a comparable group of patients with severe COVID-19 and influenza pneumonia, CT features of pulmonary hypertension are more often present in patients with COVID-19 pneumonia despite an equal clot burden on CT. This is not attributable to pulmonary thrombosis visible on CT and supports the hypothesis that micro- rather than macrovascular obstruction is the cause of severe hypoxia in COVID-19 pneumonia.

P95 ELEVATED D-DIMERS IN COVID-19 PATIENTS PREDICT PE BUT CAUTION IS NEEDED WITH HIGHER THRESHOLDS

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Introduction and Objectives COVID-19 is associated with a pro-inflammatory, hypercoagulable state, increasing the likelihood of developing pulmonary embolism (PE). Higher D-dimer levels have been noted in COVID-19 patients compared to the general population, which may lead to over-investigation by computed tomography pulmonary angiography (CTPA) if traditional thresholds (positive $\geq$0.5mg/L) are used. We aimed to investigate whether a higher D-dimer threshold could be used.

Methods A retrospective observational study was performed at Barking Havering and Redbridge University Hospitals NHS Trust from April 2020 - March 2021. The study included a cohort of confirmed/suspected cases of COVID-19 requiring hospital admission. D-dimer level on admission, CTPA outcome and requirement for intensive care unit (ICU) admission were analysed to assess D-dimer as a predictor of PE and clinical outcome in COVID-19.

Results In 404 patients included, mean D-dimer was 3.03mg/L. 186 (46%) underwent CTPA, 32 (17%) of which detected PE. In those with PE, mean D-dimer was (8.62mg/L), significantly higher than those without PE (2.55mg/L) (P = <0.0001). Patients admitted to ICU had a significantly higher D-dimer (4.35mg/L) than those who were not (2.69mg/L) (P = 0.049). Applying the traditional threshold of 0.5mg/L resulted in a sensitivity of 97% and specificity of 10% for detecting PE. Using higher thresholds of 1.0mg/L and 2.0ml/L resulted in sensitivity of 87% and 71%, and specificity of 37% and 69%, respectively.

Conclusions Our data strongly suggests that higher D-dimer levels are associated with disease severity e.g. complication with PE and requirement for ICU admission. Caution is needed as higher thresholds of 2.0ml/L or greater, as suggested in previous studies,[1] would have resulted in an unacceptably low sensitivity in this cohort. Our study highlights the need for further work evaluating use of adjusted D-dimer thresholds in patients with acute COVID-19 to aid decision making and help balance the risks of radiation associated with CTPA and consequences associated with missed diagnosis of PE.

REFERENCE

1. Ventura-Díaz S, *et al*. A higher D-dimer threshold for predicting pulmonary embolism in patients with COVID-19: a retrospective study. *Emerg Radiol*. 2020;**27**(6):679-689. doi:10.1007/s10140-020-01859-1

P96 PULMONARY VASCULAR DISEASE IN COVID-19: INSIGHTS FROM ARTIFICIAL INTELLIGENCE ANALYSIS IN A LARGE MULTICENTRE IMAGING DATABASE

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Aims and Objectives An increased incidence of pulmonary thrombosis (PT) and right ventricular (RV) dysfunction is reported in COVID-19. The clinical significance is not fully understood and there are few large, multicentre studies. The National Covid-19 Chest Imaging Database (NCCID) was analysed for prevalence of PT in COVID-19 patients; we hypothesised associations between macroscopic PT, severity of parenchymal disease, evidence of RV dysfunction on CT and mortality.

Methods NCCID is a multicentre UK-wide centralised database comprised of radiological images from hospitalised COVID-19 patients. 391 thoracic contrast CT scans from 14 centres across England and Wales performed between 2nd March 2020 – 10th September 2020 underwent automated post-processing software (IMBIO LLC.) to determine RV:LV diameter ratio. Scans were manually reported for PT and quantitatively scored for arterial obstruction and severity of parenchymal involvement using CT- Severity Scoring (CT-SS)[1]. Imaging metrics were analysed for association with PT and 30 day mortality.

Results Automated RV:LV analysis was successful in 90% (351/391) of scans. Mean age: 64, 53% (186/351) male. Mortality data was available for 325 patients: 22 died within 30 days of scan (6.7% (22/325)).

Macroscopic PT was present in 16% (56/351). Median Qanadli score was 6% (IQR 3%-17.5%), indicating low burden arterial obstruction. PT was not associated with mortality (p=0.18).

RV:LV >1 on CT was observed in 59% (206/351) (mean RV:LV 1.08). RV:LV was significantly higher in the presence of PT (mean RVLV 1.17 vs 1.06 p=0.011, $\chi^2(2) = 6.499$). RV:LV was not predictive of mortality (AUC 0.467, CI 0.358–0.576).

CT-SS significantly predicted mortality (AUC 0.787, p=<0.0005, CI 0.693–0.881). However there was no correlation between severity of parenchymal involvement and RV:LV

(r 0.82, p=0.123), nor presence of PT (χ^2(2) 2.305, p=0.129).

Conclusions RV dilatation and PT were prevalent in this multicentre cohort of COVID-19 patients, but were not associated with mortality or parenchymal disease severity. PT is frequently low burden and, in contrast to PT outside the context of COVID-19, RV:LV >1 is not discriminatory for prognosis.

REFERENCE

1. Yang R., et al. Chest CT severity score: an imaging tool for assessing severe COVID-19. Radiology: Cardiothoracic Imaging 2020;2(2):e200047. doi: 10.1148/ryct.2020200047

P97 DISEASE SEVERITY AND PATIENT RECOVERY IN COVID-19: AN OBSERVATIONAL STUDY COMPARING FIRST AND SECOND WAVE ADMISSIONS IN LONDON

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Background The COVID-19 global pandemic presents with waves of infection. International studies report key demographic and outcome differences with younger patients, lower co-morbidity and mortality reported amongst second wave patients.[1] Less is known about observed differences, subsequent recovery and 'Long covid' development. We therefore sought to explore differences in clinical severity at 8–10 week follow-up for adult discharges following acute admission with COVID-19 during London's first two waves.

Methods This prospective observational cohort study compared in each wave the first 400 patients' admission trajectory and recovery after discharge. We excluded hospital acquired cases and included unreachable patients with available admission records.

Results Groups admitted between 27/2/2020 - 05/04/2020 (first wave) and 10/12/2020 - 08/02/2021 (second wave) demonstrated similar median age 61 years (IQR: 50 – 74 vs. 51 – 74); p = 0.59); and male sex (61.8% vs. 59.3%; p = 0.47); but higher BMI in second wave admissions (26.8 vs. 27.7 kg/m^2; p = 0.015). Co-morbidity prevalence was similar, other than chronic kidney disease being more prevalent in first wave admissions (18% vs. 9.3%; p <0.0001).

On admission, second wave patients demonstrated: higher Clinical Frailty Score, lower NEWS score with more patients deemed suitable for full treatment escalation. A significant number received more: novel agents, non-invasive treatment and less invasive ventilation (table 1). Length of stay was lower (5 vs. 8 days, p<0.0001).

322 (first) vs. 365 participants (second wave) completed follow-up at 74 vs. 54 days; p<0.0001, post discharge. Second wave patients reported less mental health burden, greater self-reported recovery and symptom trajectory other than fatigue. A greater proportion had improved radiological changes. Many patients had not returned to work in both waves.

Conclusion These data suggest second wave patients, although frailer, presented with fewer symptoms and experienced improved hospital admission trajectory. They demonstrated improved self-reported mental health and physical recovery outcomes despite earlier follow-up, possibly attributed to improved in-hospital treatment. Supporting recovery remains a clinical priority given many patients had not returned to work.

Abstract P97 Table 1 Demographics and clinical characteristics of participants at hospital admission and follow up for wave 1 and 2 admissions

	Wave 1	Wave 2	p-value
	N = 400	N = 400	
Demographics and Lifestyle			
Age (years) (Median, IQR)	61 (50 -74)	61 (51 - 74)	0.59
Male gender (N,%)	247 (61.8%)	237 (59.3%)	0.47
Ethnicity (White) (N,%)	200 (50.0%)	195 (48.8%)	**0.001***
Smoking status – Never smoker (N,%)	215 (53.8%)	219 (54.8%)	0.58
BMI (kg/m^2) (Median, IQR)	26.8 (24.1 - 29.4)	27.7 (24.3 - 31.6)	**0.015**
Underlying clinical status			
Clinical Frailty Score (Median, IQR)	2 (2, 4) N = 332	3 (2, 3) N = 384	**0.001**
Shielding Status (N,%)	32 (10.1%)	39 (11.2%)	**0.001**
Extremely vulnerable	23 (7.2%)	5 (1.4%)	
HCP issued letter			
Covid Admission Severity Parameters			
Total number of symptoms (Median, IQR)	4 (3 - 6)	3 (2 - 3)	**<0.0001**
NEWS2 score (Median, IQR)	5 (2 - 7) N = 372	4 (3 - 6) N = 379	0.60
TEP status – For full escalation (N,%)	284/365 (77.8%)	361/400 (90.3%)	**<0.0001**
Maximum respiratory support (N,%)	N= 377	N = 400	**<0.0001**
CPAP	10 (2.7%)	32 (8.0%)	
NIV	2 (0.5%)	5 (1.3%)	
Received anti-viral or immunosuppressive drugs (N,%)	23/374 (6.2%)	127/400 (31.8%)	**<0.0001**
ITU admission (N,%)	62/377 (16.5%)	43/400 (10.8%)	**0.02**
Intubation (N,%)	49/364 (13.5%)	19/400 (4.8%)	**<0.0001**
Pulmonary Embolus (N,%)	22/360 (6.1%)	24/395 (6.1%)	0.98
Follow-up Outcomes			
	N = 322	N = 365	
Mental Health Outcomes			
PHQ2 score $\geq$ 3 (N,%)	47 (15.4%)	34 (9.9%)	**0.04**
TSQ score $\geq$ 5 (N,%)	44 (14.9%)	12 (3.3%)	**<0.0001**
Physical Recovery and Symptoms			
Not returned to work (N,%)	76 (24.8%)	114 (33.6%)	**0.03**
Improved Sleep quality (N,%)	168 (61.5%)	265 (78.4%)	**<0.0001**
Improved Fatigue (N,%)	241 (87.6%)	307 (88.7%)	0.91
Improved Cough (N,%)	194 (69.5%)	291 (84.8%)	**<0.0001**
Improved Breathlessness (N,%)	213 (76.1%)	311 (89.6%)	**<0.0001**
Total Number of Symptoms (Median, IQR)	1 (0 - 2)	0 (0 – 1)	
	N=314	N=364	
Radiology outcomes			
(N,%)	N=309	N=279	**<0.0001**
Normalised	211 (68.3%)	187 (67.0%)	
Significantly Improved	55 (17.8%)	65 (23.3%)	
Not significantly improved	2 (0.7%)	13 (4.7%)	
Worsened	30 (9.7%)	14 (5.0%)	

*p value likely attributable to differences in unknown ethnicity

REFERENCE
1. Saito S, *et al*. First and second COVID-19 waves in Japan: comparison of disease severity and characteristics. *J Infect*. 2021;**82**(4):84-123.

The wider impact of the pandemic

P99 COPD PATIENTS' KNOWLEDGE, TRAINING AND ADHERENCE WITH INHALATION THERAPIES DURING COVID-19

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Introduction and Objectives Effective management of chronic obstructive pulmonary disease (COPD) necessitates inhalation treatment at all disease stages. A previous UK Inhaler Group survey identified patient training and knowledge of their inhaler devices as key factors contributing to inhaler misuse and non-adherence, both known to impact clinical and economic burden. Coronavirus disease 2019 (COVID-19) potentially presents a significant risk of worsening disease management due to virtual consultations, patient shielding and self-isolation. We assessed patient engagement with inhalation therapies by understanding their treatment beliefs, knowledge, training received, and device-related concerns in pre-pandemic and pandemic periods.

Abstract P99 Table 1 Changes in self-reported knowledge, training, and adherence regarding inhaled therapies during COVID-19. Pattern analysis of participants reporting change in adherence indicates the role of patient emotions, beliefs, and experiences. Six reasons inducing adherence-promoting or adherence-limiting behaviour were identified.

Participant identifier	Change in knowledge	Change in training	Change in adherence	Reason(s) for change in adherence
2	No change	No change		Fear of contracting COVID-19
22	Decreased	Decreased		Worsening of symptoms during COVID-19
30	No change	No change		Fear of contracting COVID-19; Worsening of symptoms during COVID-19
38	No change	No change	Increased	Motivation from awareness of COPD as a COVID-19 risk factor
49	Increased	No change		Perception of high therapeutic benefit from new prescription during COVID-19; Motivation from awareness of COPD as a COVID-19 risk factor
17	Decreased	Decreased		Social isolation/depression and neglectful of COPD treatment during COVID-19
23	No change	No change	Decreased	Improvement in symptoms during COVID-19
28	No change	Decreased		Social isolation/depression and neglectful of COPD treatment during COVID-19

Methods A 60-item questionnaire, devised through an iterative process, formed the basis of ~45-minute one-to-one semi-structured telephone interviews with COPD patients. Objective medical data were obtained from electronic records.

Results Of 54 participants (females, 48%; age, 68.8±8.14 years), although 88.9% perceived to possess sufficient knowledge regarding their inhalers, only 55.6% recounted correct therapeutic indications, while 16.7% reported inclusion of an inhaler or nebuliser in their current exacerbation 'action plan'. Device training was primarily delivered non-routinely (41.7%), through face-to-face demonstrations (70.1%) pre-pandemic. However, inhaler technique reviews reduced by over two-thirds (71.4%) in the comparable pandemic period, with virtual face-to-face demonstrations constituting only 42.9% of reviews. A third (33.3%) affirmed a desire for more frequent reviews. Among participants' n=137 prescribed inhalation devices, the pressurised metered-dose inhaler (pMDI), nebuliser, and unit-dose dry powder inhaler (DPI) displayed lower usability scores. 59.3% of participants encountered multiple problems with critical steps of pMDI and DPI technique, and reiterated need for specific inhalation device features. Nevertheless, most participants reported no change in knowledge (85.2%), training (92.6%), and adherence (85.2%) regarding inhalation therapies. Adherence increased by 3.7% and reasons attributed to this change included COVID-19-induced fear, motivation, and altered symptom control likely due to 'shielding' measures.

Conclusions Disparities between patients' perceived and actual knowledge, deficiencies in training delivered, and potential for more appropriate inhalation device selection exist. COVID-19 induces bidirectional change in adherence; the impacts of 'shielding' and disruption to routine care may limit positive change. Although a larger study is required to confirm statistical significance, these findings warrant improved patient education provision.

P100 IMPACT OF THE COVID-19 PANDEMIC ON HEALTH SERVICES UTILISATION IN A LUNG CANCER SCREENING COHORT

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Background The COVID-19 pandemic has caused significant disruption to healthcare services. Participants in lung cancer screening programmes are at elevated risk of lung cancer, have high rates of comorbidities, and therefore may be adversely affected by delayed or cancelled appointments. Analysis of lung health check data collected within the SUMMIT study allow us to quantify the impact on this population.

Methods The SUMMIT study aims to assess the implementation of low-dose CT (LDCT) for lung cancer screening in a high-risk population and to validate a multi-cancer early detection blood test (NCT03934866). Enrolled participants attend three annual lung health checks. Participants attending their second (Year 1) lung health check were asked about the impact COVID-19 had on their health service utilisation the preceding year.

Abstract P100 Table 1 Factors influencing reduced utilisation of healthcare services during the covid-19 pandemic

	Reduced use of healthcare services due to the COVID-19 pandemic/Total	Relative risk (RR)
Total	**3333/8304 (40.1%)**	
Respiratory comorbidities:		
One or more respiratory comorbidities	1388/2957 (47.0%)	**RR 1.29,** p = <0.001*
No respiratory comorbidity	1945/5344 (36.4%)	
Gender:		
Male	1823/4855 (37.5%)	**RR 1.16,** p = <0.001*
Female	1510/3446 (43.8%)	
Age:		
55-59	545/1356 (40.1%)	-
60-69	1710/4216 (40.6%)	**RR 1.01** p = 0.835
70-79	1078/2729 (39.5%)	**RR 0.98** p = 0.696
Deprivation quintile:		
Quintile 1 (most deprived)	983/2474 (39.7%)	-
Quintile 2	932/2327 (40.0%)	**RR 1.01**, p = 0.845
Quintile 3	599/1510 (39.7%)	**RR 1.00**, p = 0.995
Quintile 4	606/1431 (42.3%)	**RR 1.07**, p = 0.117
Quintile 5 (least deprived)	152/418 (36.6%)	**RR 0.92**, p = 0.247

Results 8,304 participants completed a Year 1 lung health check between June 2020 and May 2021 (mean age 66.3, IQR 61–71, 4855 (58.5%) male).

3333 (40%) reported reduced health service utilisation due to the COVID-19 pandemic. Of those, 3062 (91.9%) stated this was due to the NHS cancelling or delaying appointments, whilst in 204 (6.1%) appointments were cancelled by the participant. Reasons given by participants included not wanting to burden the NHS, difficulty with telephone consultations, and concern from media reports of hospital overcrowding.

Participants with a respiratory comorbidity (COPD, bronchiectasis, asthma, fibrosis, or sarcoidosis, as self-reported at initial study visit) (RR 1.29, p=<0.001) and female participants (RR 1.16, p = <0.001) were more likely to report impacted healthcare utilisation (table 1). Reported impact on healthcare use was not significantly affected by age or socioeconomic quintile.

Conclusions 40% of individuals in a cohort at high risk of lung cancer and respiratory comorbidities reported reduced utilisation of health care services due to the COVID-19 pandemic.

Limitations to our data include the lung health check questions not distinguishing between primary and secondary care or routine and urgent visits, and self-reported co-morbidity data limited to selected respiratory conditions. Nevertheless, we provide evidence for the scale of the problem and highlight that individuals with chronic respiratory conditions are particularly likely to be impacted.

Please refer to page A193 for declarations of interest related to this abstract.

P101 MORTALITY IN PATIENTS REQUIRING HOME MECHANICAL VENTILATION DURING THE COVID-19 PANDEMIC: EXPERIENCES OF A REGIONAL SPECIALIST VENTILATION UNIT

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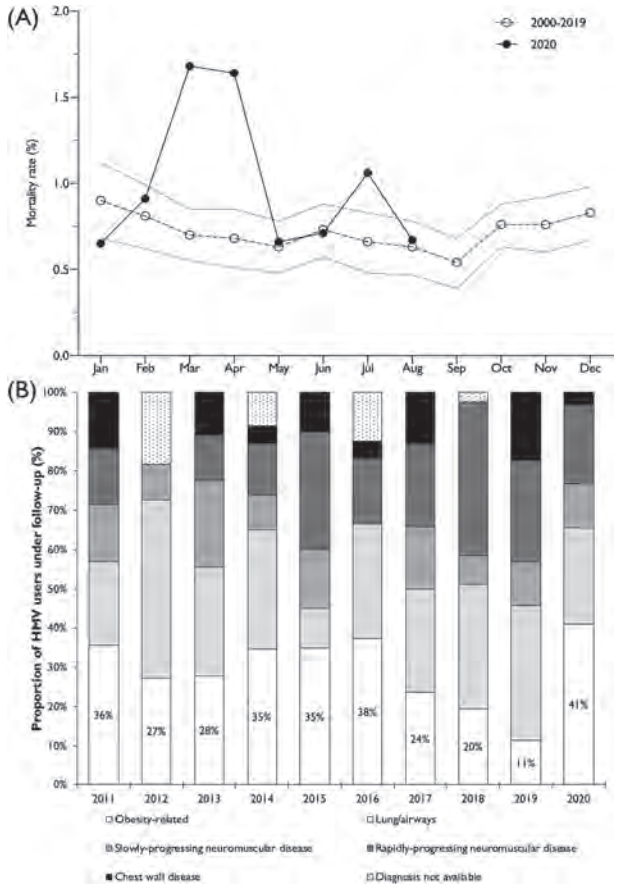
10.1136/thorax-2021-BTSabstracts.210

Introduction Deaths from severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) infection continue to increase in the UK. Patients with pre-existing comorbidities, including obesity and chronic respiratory disease, have been shown to be at increased risk of adverse clinical outcomes. The impact of COVID-19 on the survival of patients established on home mechanical ventilation (HMV) for chronic respiratory failure is currently unknown. We aimed to evaluate longitudinal trends in mortality amongst patients requiring HMV at a UK tertiary specialist ventilation unit.

Methods 20-year single-centre retrospective observational cohort study. Medical records of HMV users were used to determine mortality status and date of death. Primary cause of chronic hypercapnic respiratory failure was coded as chest

wall disease, diseases of the lungs/airways, rapidly- or slowly-progressive neuromuscular disease and obesity-related respiratory failure.

Results 4766 consecutive records between 1st January 2000 and 31st August 2020 were reviewed. Evaluation of deaths occurring during and subsequent to the UK second wave are ongoing. Mortality rates in March 2020 (1.68%) and April 2020 (1.64%) were higher than 2000–2019 (mean ±SD 0.70±0.34% and 0.68±0.39% in March and April, respectively) (figure 1A), followed by a fall in May to 0.66%, comparable to pre-COVID levels. A larger proportion of HMV users with obesity-related respiratory failure died between March-April 2020 (41.0%) compared to the same period in 2019 (11.4%) and all previous years (figure 1B). The proportion of HMV users with lung/airways disease, slowly-progressive neuromuscular disease and chest wall disease who died in this period were reduced compared to previous years.



Abstract P101 Figure 1 (A) Monthly mortality of patients under Lane Fox Respiratory Service follow-up, dotted lines represent upper and lower bounds of 95% confidence intervals (B) Proportion of home mechanical ventilation (HMV) users in each disease category who died between 1st March and 30th April by year

Conclusions Deaths amongst HMV users at our regional ventilation centre were highest in the first two months following the onset of the COVID-19 pandemic. A subsequent fall in mortality may relate to effective shielding advice following national lockdown and departmental guidance offered. The majority of deaths were in patients with obesity-related respiratory failure. These data support previous observations that obesity is a major risk factor for adverse outcomes in patients with COVID-19.

P102 PSYCHOSOCIAL THEMES OF THE IMPACT OF THE COVID-19 PANDEMIC AND SHIELDING IN ADULTS AND CHILDREN WITH EARLY-ONSET NEUROMUSCULAR DISORDERS AND THEIR FAMILIES

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10.1136/thorax-2021-BTSabstracts.211

Introduction Most patients with early-onset neuromuscular disorders (NMDs) were advised to shield during the pandemic due to assumptions that treatments e.g. corticosteroids, or complications e.g. pre-existing respiratory failure would increase COVID-19 risk. It remains poorly understood how those with NMDs and their families approached and responded to risk mitigating strategies e.g. shielding. We aimed to determine themes describing the psychosocial impact of the COVID-19 pandemic and measures taken to reduce risk in this population.

Methods In-depth questionnaires specifically designed to meet research aims were completed by telephone between September 17th and December 31st 2020 by patients with NMDs or their parent. Inductive thematic analysis was performed to first code transcriptions of audio recordings of questionnaires then develop candidate themes by exploring coded data. Candidate themes were evaluated against the original data set before defining final themes: participant validation was sought to provide additional confirmation of accuracy.

Results 40 questionnaires were completed: patients were 70% male, aged 2 to 48 years with NMDs e.g. muscular dystrophies, spinal muscular atrophy. 80% required long-term non-invasive or tracheostomy ventilation. Three themes were identified: 1) concern regarding the health impact of COVID-19; 2) perceptions of strategies to prevent SARS-CoV-2 transmission; 3) psychological impact of the COVID-19 pandemic. Anxiety, fear and worry were the most frequently reported emotions, particularly in relation to health risk of COVID-19, but level and pervasiveness fluctuated during the pandemic. Strict adherence to shielding was reported at the start of the pandemic but was often relaxed due to 1) official guidance, 2) emerging evidence of less severe outcomes in children and NMD cohorts, and 3) unsustainability of limited social contact including cessation or reduction in personal care. Concern about hospital attendance during the pandemic, and anxiety regarding perceived lack of access to Intensive Care were common.

Conclusions Measures to reduce transmission of COVID-19 have disproportionally affected patients with NMDs and their families. For most, negative psychosocial impacts have and will continue to improve, particularly due to the success of the vaccination programme. These aspects should be considered when advising patients and families on risk and risk-mitigating strategies during the current and future pandemics.

P103 PROVISION OF PLEURAL DISEASE CARE IN THE PANDEMIC ERA: A SINGLE CENTRE EXPERIENCE

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10.1136/thorax-2021-BTSabstracts.212

Introduction and Objectives The emergence of COVID-19 disease has had a substantial impact on healthcare services worldwide. We aimed to study its impact on our outpatient pleural service.

Methods We conducted a retrospective review of all new patients who underwent day case procedures by the pleural team from March 2019 to March 2021 and divided them into two groups, pre pandemic group (22 March 2019 to 21 March 2020) & pandemic group (22 March 2020 to 21 March 2021).

Data was collected on demographics and treatment outcomes.

Results 82 patients were identified in pre pandemic group undergoing 157 procedures in 152 procedural episodes, whereas in pandemic group 83 patients underwent 132 procedures in 122 procedural episodes. Results are summarised in table 1.

Conclusion Despite the pressures of the pandemic on health care system, pleural activity remained relatively stable. Number of procedural episodes were lower in the pandemic group due to combining the procedures where appropriate and streamlining IPC reviews and drainages by finding alternative ways of managing these patients in the community.

Abstract P103 Table 1 Results

	Pre pandemic group	Pandemic group	*p* value
Number of patients	82	83	
Number of procedures	157	132	
Number of procedural episodes	152	122	
Sex – Female (%)	35 (42.7)	40 (48.2)	0.477
Age, mean (SD), yrs	65.3 (14.4)	66.5 (14.9)	0.60
Interval between referral and date of procedure, median (IQR), days	4 (6) n= 75	3 (6) n= 75	0.134
Interval between sampling & histocytological diagnosis, median (IQR), days	5 (3) n= 66	4 (4) n= 76	0.003
Types of procedures (%)			
Diagnostic and/or therapeutic pleural aspirate	60/157 (38.2)	63/132 (47.7)	
Indwelling pleural catheter review & or drainage	62/157 (39.5)	15/132 (11.4)	
Indwelling pleural catheter insertion	20/157 (12.7)	28/132 (21.2)	
Percutaneous pleural biopsy	7/157 (4.4)	7/132 (5.3)	
Medical thoracoscopy	3/157 (1.9)	4/132 (3)	
Other procedure	5/157 (3.2)	15/132 (11.4)	
Diagnoses%			
Malignancy	46/82 (56.1)	45/83 (54.2)	
Benign disease	36/82 (43.9)	35/83 (42.2)	
Infection	0/82 (0)	3/83 (3.6)	

P104 COVID-19 MORTALITY IN CANCER PATIENTS ON SYSTEMIC ANTI-CANCER TREATMENTS DURING THE SECOND UK SARS-COV-2 WAVE

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10.1136/thorax-2021-BTSabstracts.213

Background Recent multicentre registries have shown cancer patients infected with SARS-CoV-2 have significantly higher mortality compared to patients without cancer[1]. Cancer-specific features associated with worse outcomes include advanced tumour stage, disease progression and lung cancer.[1] Systemic anti-cancer treatments (SACT – chemotherapy, immunotherapy, targeted and hormone therapy) have been postulated to increase mortality from COVID-19 in cancer patients. Here, we aim to determine if cancer patients on SACT have a higher risk of mortality than those not on active treatment.

Methods We retrospectively analysed cancer patients admitted to a Greater London District General Hospital between 1st November 2020 and 28th February 2021 with RT-PCR positive COVID-19. SACT was considered present if administered within 3 months of admission. Mortality encompassed hospitalised patients and those up to 28 days post-discharge. Association of cancer-specific demographics and mortality was assessed using logistic regression analyses adjusting for age, sex and comorbidities.

Abstract P104 Table 1 Mortality rate after presentation of COVID-19 by: tumour type, time from cancer diagnosis, cancer stage, progression of disease, and systemic anti-cancer treatment (SACT).

		Number	mortality number	mortality %	odds ratio
Cancer type	Solid organ	75	28	37.3	1.32
	Lung	18	11	61.1	4.66**
	Haematological	29	11	37.9	1.47
Time from diagnosis	<12 months	55	25	45.5	2.32**
	>12 months	67	25	37.3	1.25
STAGE AT DIAGNOSIS	4	46	23	50.0	2.82***
	3	26	13	50.0	2.17
	2	14	5	35.7	1.22
	1	31	8	25.8	0.77
	0	5	1	20.0	0.46
disease progression (<3 months BEFORE COVID-19)	Yes	38	22	57.9	4.60***
	No	84	28	33.3	1.07
SACT (<3 months BEFORE COVID-19)	Yes	53	69	34.0	1.49
	No	69	32	46.4	1.80**

*p<0.05 **p<0.01 ***p<0.001

Results Mortality rate was significantly higher in 122 cancer patients with COVID-19 than 1220 patients without cancer (OR 1.653, p=0.014), especially in patients with lung cancer (OR 4.664, p=0.002). 55 patients diagnosed with cancer within one year had a significantly higher mortality (OR 2.32, p=0.004). Stage 4, but not earlier stages of, cancer at diagnosis had much higher mortality (OR 2.82, p<0.001). Progression of cancer was highly predictive of mortality (OR 4.60, p=0.00002). SACT had no significant effect on mortality from COVID-19 disease when compared with cancer patients who had no active treatment. However, cancer patients that did not have SACT within 3 months were more likely to die (OR 1.80, p=0.025).

Conclusion Among patients with cancer and COVID-19, mortality was high and associated with cancer-specific features. There was no evidence cancer patients on systemic anti-cancer treatments possessed higher mortality from COVID-19 disease, which correlates with findings from COVID-19 and cancer registries[1]. Patients that did not receive SACT within 3 months before COVID-19 and therefore more likely to have palliative treatment did demonstrate high mortality. Larger studies are needed to confirm the risk of mortality and timing of SACT before COVID-19 disease.

REFERENCE

1. Lee AJ, *et al*. *British Journal of Cancer* 2021;**124**:1777–1784.

P105 BREAKING BARRIERS TO SINGING FOR LUNG HEALTH DURING THE COVID-19 PANDEMIC

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10.1136/thorax-2021-BTSabstracts.214

In 2010 the British Lung Foundation (BLF) launched 'Singing for Lung Health' (SFLH), an initiative to promote singing as part of a group, for patients with chronic lung conditions. This has been shown to be beneficial to mental wellbeing, lung health and quality of life in this group of patients.[1]

In 2019 a local SFLH group was established and around 30 patients with chronic lung conditions participated. When asked, all participants reported an improvement in their physical or emotional health. Personal feedback showed just how positively the sessions had impacted these patients, highlighting the holistic benefits of this initiative in practice (table 1).

The arrival of the COVID-19 pandemic caused the group to be put on hold. This barrier posed a challenge to be overcome and in 2020 the SFLH group was moved online and has continued on this platform ever since.

The majority of the participants reported a decline in their physical health and increase in social isolation as a result of the pandemic. The online SFLH group has provided an outlet for these patients who are among the most isolated and vulnerable groups in the population. As a result of the sessions over 80% of participants felt an improvement in breath control and 63% reported an improvement in mood. Personal feedback was extremely complementary showing that the online platform for the sessions has been as effective as it had been in person and that the sessions have been appreciated all the more since the pandemic (table 1).

Abstract P105 Table 1

In person SFLH Patient feedback	Online SFLH Patient feedback
'Brilliant, life feels brighter. Breathing improvement'	'I feel that my lung capacity has improved a good deal and that this…has resulted in my being a good deal less breathless when out walking.'
'uplifted and relaxed'	'Breathing and relaxing exercises are very beneficial to us… also a good social experience, especially in these very restricted times'
'positive in what I achieved'	'The class is an utter joy and a lifeline'
'meeting people with the same complaint I have'	'I can keep fitter than I would otherwise'
'improves my outlook on life'	'The on-line weekly meeting has been a major blessing during lockdown'
'as long as it takes place I will be there'	'I enjoy the classes very much'
'keeps me in trim for the next 48 hours'	'Feel better afterwards'
'Feel better than I did when I arrived'	'so joyful and uplifting!'
All participants reported an improvement in their physical or emotional health and would recommend the SFLH sessions to a friend with breathing difficulties	80% of participants felt an improvement in breath control and 63% reported an improvement in mood.

This kind of initiative is needed for those struggling with chronic lung conditions and the ability to provide this service online means more patients can benefit.

Special thanks to Annie Summers the group's BLF trained SLFH instructor and to Andi Licqurish and Dennis Schiavon from Encore Enterprises.

REFERENCE

1. Lord V, Cave P, Hume V, Flude E, Evans A, Kelly J, Polkey M, Hopkinson N. Singing teaching as a therapy for chronic respiratory disease - a randomised controlled trial and qualitative evaluation. *BMC Pulmonary Medicine*, 2010;**10**(1).

P106 THE IMPACT OF TECHNICIAN-LED VIRTUAL SPIROMETRY SESSIONS ON THE AVAILABILITY AND QUALITY OF HOME SPIROMETRY RESULTS IN A VIRTUAL CYSTIC FIBROSIS CLINIC

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10.1136/thorax-2021-BTSabstracts.215

Introduction Spirometry is an essential component of monitoring the health of people with Cystic Fibrosis (CF). Since the Covid-19 pandemic, most consultations have been conducted via video conferencing. All appropriate patients were given MIR Spirobank® portable spirometers (MIR Medical International Research Srl) and asked to send in readings before each clinic. We noticed a fall in the number and quality of spirometry reports available to clinicians in virtual clinics compared to face-to-face reviews. We set out to improve this through a Respiratory Physiologist-led virtual spirometry clinic.

Methods Spirobank® spirometry reports (including grading of quality using ATS/ERS criteria[1]) provided by patients attending virtual CF clinics in our CF centre in January 2021 were reviewed. Following this review, a virtual spirometry clinic was established (running before the main clinic) in which the patient performs spirometry via the 'Live Video Exam' app on

their mobile device, coached by a Physiologist who is able to see the patient via their mobile phone camera and view spirometry flow loops in real time, downloading results ready for the subsequent clinic. Review of spirometry available for clinics in May 2021 was then performed and the number and quality of reports available compared.

Results Spirometry reports were available for 35 out of 70 appointments for patients with Spirobank® devices in January 2021, of which 26/70 (37%) were ATS grade A or B. In May 2021, 50 patients with devices had clinic appointments: 9 provided reports independently (7 grade A or B), 37 were coached by a physiologist (31 A or B), and 4 did not attend or declined a coaching session.

Conclusion Without coaching, only 37% patients with a Spirobank® device provided ATS grade A or B spirometry for virtual CF clinics; this increased to 76% with the introduction of pre-clinic online Respiratory Physiologist coaching sessions.

We plan to review how the number and quality of reports provided with and without coaching changes as patient experience in the use of home spirometers increases.

REFERENCE

1. Standardization of Spirometry 2019 Update. *American Journal of Respiratory & Critical Care Medicine* 2019;200(8):e70–e88.

P107 CREATING A NEW ROLE ON RESUSCITATION TEAMS RESPONSIBLE FOR PPE AND TEAM SAFETY SIGNIFICANTLY IMPROVES THE SAFETY OF RESUSCITATION TEAMS WORKING IN THE PANDEMIC: A SINGLE CENTRE STUDY

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10.1136/thorax-2021-BTSabstracts.216

Introduction and Objectives Due to the COVID pandemic, aerosol generating procedures at resuscitation calls have created new risks for resuscitation teams. In our centre we identified that during resuscitation calls, PPE guidelines were often not being followed due to the focus of all the resuscitation team members being primarily on managing unwell patients rather than personal safety. This study aimed to assess whether the introduction of a new role in the resuscitation team with responsibility of ensuring full PPE protection for all team members, a 'PPE lead', could improve the safety of resuscitation teams.

Methods In December 2020, at the start of the 'second COVID wave' we created a new role on every resuscitation team, a PPE lead, whose responsibility was to ensure that all other team members received correct PPE provision and were using this correctly during resuscitation calls.

The effectiveness of this change was measured by asking resuscitation staff to complete a questionnaire. Standard statistical analysis was undertaken.

Results 32 questionnaires were given to resuscitation team members with 100% returned. 28 (87.5%) respondents agreed or strongly agreed that the introduction of a PPE lead in the resuscitation team helped to improve adherence to PPE guidelines at arrest calls, compared to 4 (12.5%) respondents who remained neutral ($p<0.001$). 27 (84.4%) respondents agreed or strongly agreed that the introduction of a PPE lead improved personal safety, compared to 5 respondents (15.6%) who remained neutral ($p<0.001$).

Conclusion Effectively protecting healthcare staff from exposure to COVID remains paramount, especially with concerns regarding new variants which are more transmissible. This study has shown that listening to the concerns of staff can lead to innovative improvements. To our knowledge this is the first study that has introduced within the resuscitation team a PPE lead.

This study has established that a PPE lead helps improve adherence to PPE guidelines, and helps healthcare staff feel safer. Our study helps evidence the need to introduce a PPE lead on resuscitation teams on a national level.

P108 ANNUAL PHYSIOTHERAPY REVIEWS IN A SPECIALIST RESPIRATORY CLINIC FOR BRONCHIECTASIS: THE IMPACT OF COVID-19 ON AN ALREADY STRAINED WORKFORCE

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10.1136/thorax-2021-BTSabstracts.217

Introduction The British Thoracic Society Guidelines (2019) require individuals with bronchiectasis in secondary care clinics are seen annually by a respiratory physiotherapist.

The NHS Long Term Plan (2019) emphasises respiratory as a priority area and acknowledges an increase in workforce is needed. COVID-19 has had a drastic impact upon healthcare provision, with a reduction in access to care for many patients with chronic respiratory diseases (Chudasama, et al., 2020).

Objectives To analyse the impact of COVID-19 on the number of bronchiectasis patients receiving an annual physiotherapy review within a specialist respiratory clinic.

Methods Patient databases were analysed and coded to identify the number of patients active in the clinic between 31/03/2019–2020, and 01/04/2020–2021, and the percentage of whom received a physiotherapy review during the respective periods. These dates were selected taking into account COVID-19 government directives and resultant clinic operating restrictions. Virtual consultations were included.

Results The percentage of bronchiectasis patients who received a physiotherapy review declined by 25.7% during COVID-19. See table 1 for results.

Conclusion The respiratory workforce has been central in the acute response to COVID-19, whilst reduced provision of pulmonary rehabilitation and specialist respiratory clinics has led to a significant reduction in access to care for patients with chronic respiratory conditions reliant on highly specialised management. It is anticipated that the consequences on chronic disease burden will continue to unfold long after the pandemic has been controlled.

This research identifies a significant unmet need of physiotherapy within a specialist respiratory service, exacerbated by COVID-19. A wider exploration into respiratory workforce

Abstract P108 Table 1 Delivery of annual physiotherapy reviews before and during COVID-19

Year	Patients for review	Patients reviewed	% patients reviewed
31/03/2019–2020	392	226	57.7
01/04/2020–2021	408	130	31.9

nationally will help to further understand the increased need in a COVID-19 world.

REFERENCES

1. BTS. British Thoracic Society Guidelines for Bronchiectasis in Adults. *Thorax*, 2019 December;**74**(1):3.
2. Chudasama Y., *et al*. Impact of COVID-19 on routine care for chronic diseases: A global survey of views from healthcare professionals. *Diabetes Metab Syndr*. 2020;**14**(5):965–967.
3. NHS. *The NHS Long Term Plan*. 2019. [Online] Available at: www.longtermplan.nhs.uk [Accessed 15 June 2021].

P109 INFECTION CONTROL POLICIES DURING THE COVID-19 PANDEMIC WERE EFFECTIVE IN LIMITING MORBIDITY AND MORTALITY ASSOCIATED WITH NOSOCOMIAL VIRAL TRANSMISSION AT A LARGE NHS RESPIRATORY DEPARTMENT

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10.1136/thorax-2021-BTSabstracts.218

Introduction Prevention of nosocomial transmission was a priority for NHS hospital teams during the SARS-COV-2 pandemic. However, infection control policies were developed in the face of uncertainty about duration of infectivity, routes of transmission, and safety of shared admission spaces. We retrospectively reviewed all hospital admissions to the University Hospitals of Leicester (UHL) respiratory department, which managed more than 30% of UHL patients with a diagnosis of COVID-19 between March 2020 and March 2021to determine the proportion of cases with laboratory evidence of healthcare associated infection (HCAI) and mortality within 28 days of PCR conversion

Methods This was a retrospective cohort study performed using a bespoke database collating COVID-19 throat swab (TS) PCR results for UHL (COVTRACK). Nosocomial transmission was identified by demonstrating PCR conversions during admission and categorized into definite (conversion time > 14 days) or probable (conversion time 8–14 days). In depth records based analysis was undertaken for patients admitted to respiratory medicine (RM) and deceased within 28 days after conversion.

Results Out of 10485 patients admitted to the Respiratory Department at UHL, 2054 (19.6%) were COVID-19 spell positive, including 57 with probable (41) or definite HCAI (16). 23 patients (7 with definite HCAI) died within 28 days of PCR conversion (0.22%, of total admitted, 1.1% of COVID19 positive), with 21 (91%) deaths in the 2nd wave. Compared with non-COVID admissions not acquiring nosocomial infection, HCAI was significantly associated with older age (mean difference (95%CI) 11.5 (7.5–15.5) years), length of stay (median LOS 18 Vs 1 day) and multiple ward occupancy (median 3 vs 1 ward); all analyses $p<0.001$.

Discussion Our analysis suggests HCAI with SARS-COV-2 contributed a very small fraction of COVID-19 related morbidity and mortality at our department and in the majority the trajectory of care was not changed. Despite the high numbers of highly infectious cases during the 1st and 2nd wave, we successfully implemented a suite of infection control measures that effectively mitigated risk. High throughput in admission areas, multiple ward moves, and prolonged hospital stay were significant risk factors associated with HCAI.

P110 ASSESSING COVID VACCINE RELATED SIDE-EFFECTS PROFILE AND SUBSEQUENT STAFF SICKNESS BURDEN IN HEALTHCARE WORKERS

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10.1136/thorax-2021-BTSabstracts.219

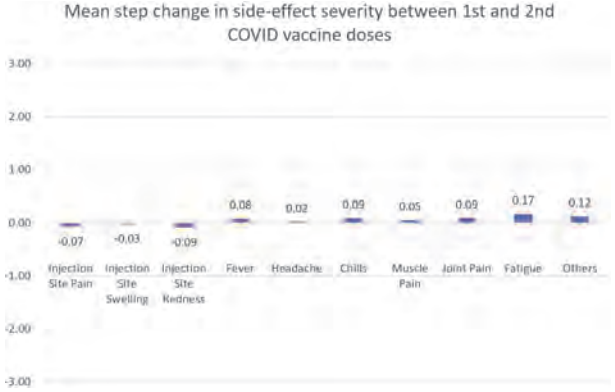
Introduction The COVID19 national immunisation campaign is well underway across the United Kingdom. A large study reported, side-effects from COVID vaccines are moderately frequent, commonly mild and short-lived in a community setting.[1]

Objectives To examine the side-effects and staff sickness profile from COVID vaccination in healthcare workers and whether the second COVID vaccine dose (VAX2) led to worsening side-effects or sickness burden, compared to the first dose (VAX1).

Methods Self-reported questionnaire survey to 1500 consecutive healthcare workers (working for 1 NHS Trust) receiving VAX2 at a single central vaccination site from 29/03/2021 to 23/04/2021. VAX1 data was collected at the appointment and VAX2 data asked to be returned via internal mail 7 days later. Responders were asked to grade symptoms (asymptomatic, mild, moderate or severe) & step scores of 0, 1, 2 & 3 allocated correspondingly to estimate side-effect severity changes following VAX2. Data for baseline demographics & sickness burden collected.

Results The response rate for VAX1 was 81% (1213) & VAX2 was 31% (464). Matched data was available for 30% (444). There was 81% female preponderance. Median age was 51 (Range 19–74, IQR 18). Most commonly reported side-effect was injection site pain (83%) followed by fatigue (46%), muscle pain (45%), headache (41%), injection site swelling (32%), injection site redness (27%), joint pain (26%), chills (21%) & fever (17%). The frequency of side-effects was similar with no significant severity change after VAX2. Mean duration of side-effects was alike (2.2 days). 3.6% and 5.6% of responders took time (mean) off work for 3.6 and 1.4 days following VAX1 & VAX2 respectively.

Conclusions Our study demonstrated healthcare workers had moderately frequent side-effects, with no significant exacerbation after VAX2. The side-effects burden was short-lived with minimal impact on workforce during resource constrained times, which suggests future booster doses in healthcare workers should remain safe and can be pursued.



Abstract P110 Figure 1

REFERENCE

1. Menni, et al. Vaccine Side-Effects and SARS-CoV-2 Infection after Vaccination in Users of the COVID Symptom Study App in the UK: A Prospective Observational Study. The Lancet Infectious Diseases 2021Apr 27. https://doi.org/10.1016/S1473-3099(21)00224-3

P111 THE IMPACT OF COVID-19 ON A TERTIARY INTERVENTIONAL BRONCHOSCOPY SERVICE

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10.1136/thorax-2021-BTSabstracts.220

Introduction Malignant central airway obstruction (MCAO) is a life-threatening complication of lung cancer requiring urgent therapeutic bronchoscopy to alleviate symptoms. Delayed diagnosis contributes to increased mortality in this patient group. The COVID-19 pandemic has resulted in lack of access to timely diagnostic investigations and patient reluctance to seek help. Furthermore, the overlapping symptoms of COVID-19 make recognition of MCAO difficult. We aimed to evaluate the impact of the pandemic on urgent referrals to our tertiary interventional bronchoscopy service.

Methods We collected data on patients with MCAO who underwent urgent interventional bronchoscopy between April 2019 and April 2021. All individuals requiring emergency inpatient transfer or emergent bronchoscopy were included. Treatment modalities included laser ablation, non-thermal techniques, mechanical debulking, and airway stent placement.

Results Forty-two interventional bronchoscopy procedures were carried out between April 2019 and March 2020. There was an 85% increase in patients needing urgent bronchoscopy in the year that followed the first national lockdown, with 78 procedures undertaken between April 2020 and March 2021. There were more emergency inpatient transfers (n=48, 61.5%) compared to the year before (n=22, 52%) and more patients required airway stenting (n=31, 39.7% compared to n=10, 23.8%). The busiest periods were June – August 2020 and February – April 2021, with the peak number of therapeutic bronchoscopies undertaken following the first and second wave of the pandemic, respectively (figure 1).

Conclusions The data shows the impact of the pandemic on our tertiary service with an increase in referrals over the year following the first lockdown. More patients required emergency inpatient transfers and a higher proportion required airway stents reflecting more advanced and symptomatic disease. Unsurprisingly, the busiest months followed the national peaks of COVID-19 cases. The public health messaging required to control the pandemic, although necessary, coupled with an overlap of symptoms has resulted in an increase in presentations of life-threatening MCAO. This highlights the importance of early detection of lung cancer and recognition of symptoms of central airway obstruction.

P112 THE IMPACT OF COVID-19 PANDEMIC ON LUNG CANCER DIAGNOSIS AND TREATMENT AT ST GEORGE'S HOSPITAL

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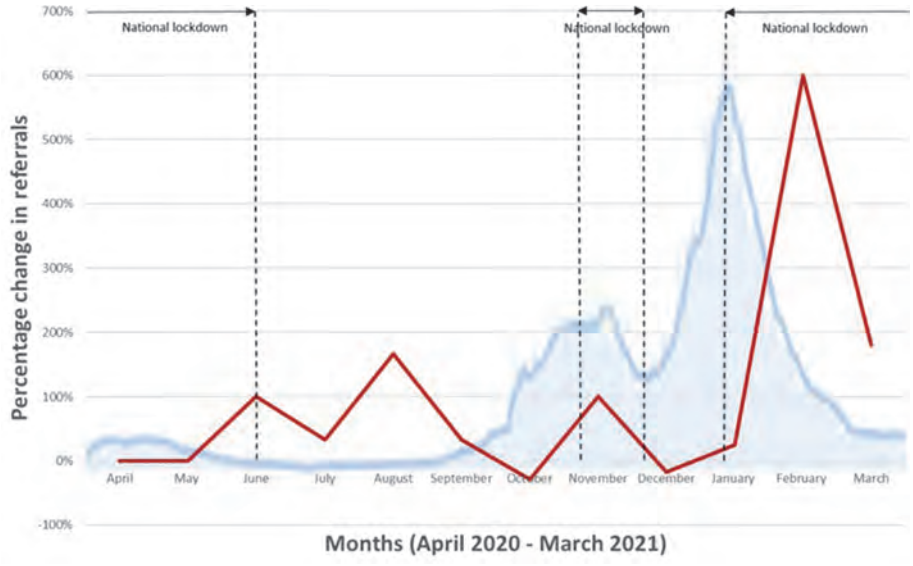
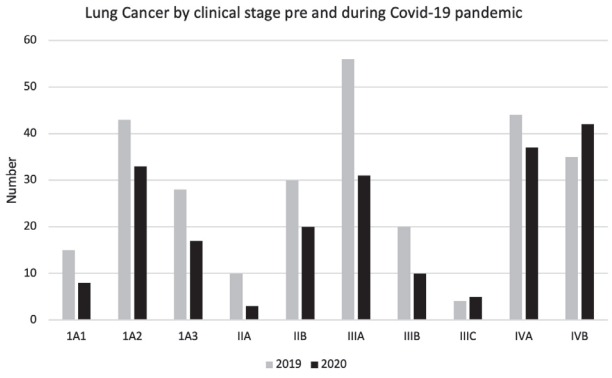
10.1136/thorax-2021-BTSabstracts.221

Introduction The Covid-19 pandemic resulted in a reduction in provision of cancer services. A comparison of frequency, staging and treatment of lung cancers was undertaken for two consecutive years at our institution.

Methods Electronic records and databases were interrogated; patients from our local MDT who were treated for lung cancer were identified. Two yearly groups were created from April 2019 pre-pandemic (2019) and April 2020 during the pandemic (2020). Diagnoses, staging, therapies, and treatment times were examined. Data was assimilated and analysed using STATA 17. Categorical variables were compared using Chi-squared test and numerical variables by Mann-Whitney test. P values of <0.05 were considered significant.



Abstract P111 Figure 1 Monthly percentage change in referrals during pandemic from pre-pandemic year. National trend in COVID-19 cases in background for comparison



Abstract P112 Figure 1 Lung cancer by clinical stage pre and during COVID-19 pandemic

Results The total number of lung cancer patients was 286 (2019) and 207 (2020). Median age (2019) was 72 (21–93) and (2020) 71 (22–93). The median times from referral to treatment were 35 days (1–209) (2019) and 38 days (1–532) (2020) p=0.0333. Figure 1 shows the absolute frequency of lung cancers by clinical stage for each period. A 44% drop in surgery was seen during the pandemic (150 to 84) with a 73% increase in radiotherapy treatments (15 to 26). Combined and systemic therapies were reduced 25% (76 to 57). Best supportive care reduced by 11% (45 to 40).

Conclusion The Covid pandemic had a major impact on our lung cancer service. A noticeable reduction in early stage (IA1-IIB) lung cancers were seen from 126 (44%) to 81 (39%). It can be postulated that during the Covid-19 pandemic, there was a reduction in routine CT scanning for other organs, which often picks up incidental early stage lung cancers. So far there has not been an increase in the numbers of later stage cases, but it can be hypothesised that these patients may present in the coming months as they are unlikely to become symptomatic within a year with early lung cancers. There is an important cohort of patients with early stage disease suitable for radical treatment that may have been missed since Covid-19 started and measures should be put in place to try to identify them as soon as possible.

Thinking outside the lung: monitoring and management of patients with CF, PCD and bronchiectasis

P113 SEGREGATION IN CYSTIC FIBROSIS: THE PERCEPTIONS OF PATIENTS AND CAREGIVERS

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10.1136/thorax-2021-BTSabstracts.222

Introduction In attempt to limit the cross-infection morbidity and mortality, segregation amongst those with CF is encouraged. Despite the long-standing nature of segregation, the perceptions of patients remain relatively unexplored in the literature. The aim of this study is to identify the perceptions of patients as well as the possible negative effects of segregation on mental health.

Methods A semi-structed questionnaire was distributed to paediatric (n=25) and adult CF patients (n=72) within NHS Grampian. Inductive coding analysis was used to analyse responses and key themes produced

Results A total of 12 paediatric (48%) and 12 adult (17%) questionnaires were returned. Paediatric participants and caregivers' perception of segregation were mostly negative in nature, whereas adult perception were more mixed with participants reporting it is positive and negative for them. The perceived impact of segregation on mental health was mixed and only slightly more participants (n=x) reported that it had a negative impact of their mental health. Half of paediatric and adult participants wished for increased contact with others with CF in future. Areas for suggested local service improvement focused on creation and promotion of local support and CF community groups via social media platforms and an allocated 'CF buddy'.

Conclusion The perceptions of segregation and its impact on the mental health differs largely between participants in both paediatric caregiver and adult patient groups. These perceptions are likely formed from previous/witnessed CF segregation experience, as well as illness severity and environmental factors. Further research is needed to assess the possible influences of these factors on mental health in CF populations.

Please refer to page A193 for declarations of interest related to this abstract.

P114 ASYMMETRICAL DISTRIBUTION OF DEMAND FOR CYSTIC FIBROSIS INPATIENT SERVICES AND IMPLICATIONS FOR FUTURE CARE NEEDS

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Introduction and Objectives Clinical expression of cystic fibrosis (CF) is highly variable, even amongst patients with the same CFTR genotype. The aim of this study was to identify those with a high demand for inpatient care, in order to aid understanding of the potential impact of new CFTR modulator therapies. We have looked at pre-Kaftrio patterns of admission, risk factors and outcomes.

Methods The study was conducted at the Adult Cystic Fibrosis Centre, total clinic size 413 patients. Inpatient records were reviewed for 36 months from 2017–19. Inpatient care was measured as bed-days. Patients leaving the service in the calendar year 2017 or entering after this were not included. Outcomes were recorded at end of 2019. Outpatient care episodes were not included. Demographic factors relevant to CF were assessed for statistical significance as predictors of high bed usage using a binomial logistic regression model.

Results There was a significant skew in the demand for inpatient care. 97 patients (23%) required no inpatient care. On the other hand, 15% of the clinic cohort (63 patients) accounted for 58% of the total bed-days. CF-related diabetes and low FEV1% predicted were statistically significant predictors of falling within this high bed use group (P=0.007 and P<0.001 respectively). Those in the high bed use group had a mean of 67 days of admission/year. By the end of 2019, 14 (22%) patients from this group had died and 8 (13%) were transplanted (compared with 0.6% and 1.7% in the remainder of the CF clinic). Annual mortality rate was 10x greater than the rest of the clinic. Of the high bed use survivors at the end of 2019, 31 (76%) were eligible for Kaftrio.

Conclusions Demand for inpatient care in CF is hugely variable, with a high burden of care being concentrated in a small proportion of patients. CF diabetes and low lung function are risk factors. These patients have high mortality. Kaftrio is likely to decrease the need for inpatient care for many of these, but a small cohort with unresponsive genes will continue to require high levels of specialist inpatient care.

P115 THE DIAGNOSIS AND MONITORING OF CYSTIC FIBROSIS LIVER DISEASE IN A WEST OF SCOTLAND CF COHORT

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10.1136/thorax-2021-BTSabstracts.224

Introduction Cystic fibrosis [CF] is a systemic disease resulting from loss of function of the CFTR protein. Despite being a significant cause of mortality, CF liver disease [CFLD] remains under recognised.

This study determined the prevalence of CFLD and CFLD-cirrhosis in our cohort of adult CF patients and the adherence to local surveillance protocols for diagnosing and monitoring these conditions.

Methods The study identified 270 patients with a diagnosis of CF in the West of Scotland Adult CF Service. Electronic clinical records were reviewed to determine the prevalence of pre-existing diagnoses of CFLD and assess for evidence of cirrhosis. Appropriate liver monitoring and gastroenterology service involvement, as per locally agreed protocols, was reviewed.

Results The mean age of the cohort was 32 years (range 16–71) and 145 (54%) were male. A pre-existing diagnosis of CFLD occurred in 80/270 (30%) patients, 23 (29%) of whom had evidence of CFLD-cirrhosis - 9% of the total cohort.

The local standard of yearly and 6 monthly liver function tests [LFT] in non-CFLD and CFLD/CFLD-cirrhosis patients respectively was met in 241/270 individuals (89%).

The local standard of 5 yearly, 2 yearly and 6 monthly ultrasounds in non-CFLD, CFLD and CFLD-cirrhosis patients respectively was achieved in 190/270 individuals (70%).

Of those with CFLD/CFLD-cirrhosis, regular follow up with or previous discharge from gastroenterology services occurred in 34/80 patients (43%).

Abstract P115 Table 1

	Non-CFLD [190/270; 70%]	Non-Cirrhotic CFLD [57/270; 21%]	CFLD Cirrhosis [23/270; 9%]
LFT Standard Met [Yearly LFT Non-CFLD; 6 monthly LFT CFLD/CFLD-cirrhosis]	173/190 (91%)	49/57 (86%)	19/23 (83%)
Ultrasound Standard Met [5-yearly US Non-CFLD; 2-yearly US Non-cirrhotic CFLD; 6-monthly US CFLD-cirrhosis	138/190 (73%)	35/57 (61%)	17/23 (74%)
Gastroenterology Referral	N/A	22/57 (39%)	12/23 (52%)

Conclusions CFLD is a source of significant morbidity and mortality in CF patients and affects 30% of our patient cohort, with evidence of cirrhosis in 29% of CFLD patients. However, a risk of delayed or missed CFLD diagnosis has been identified for patients not receiving 5 yearly screening ultrasound and regular LFT monitoring. Additionally, patients with CFLD or CFLD-cirrhosis are not always receiving more intensive liver monitoring such as increased ultrasound and LFT testing frequency. Improvements also need to be made to ensure all CFLD/CFLD-cirrhosis patients are referred to gastroenterology services.

We will strengthen existing protocols guiding liver monitoring and referral pathways for non-CFLD, CFLD and CFLD-cirrhosis patients.

P116 A NOVEL TOOL TO INTERPRET THE INCREMENTAL SHUTTLE WALK TEST (ISWT) IN A CYSTIC FIBROSIS (CF) PAEDIATRIC POPULATION

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10.1136/thorax-2021-BTSabstracts.225

Introduction Cardiopulmonary exercise testing (CPET) is the gold standard for the assessment of exercise tolerance but is not widely available. There is increased recognition of the prognostic value of exercise tolerance in patients with CF but there is a lack of normative values for other exercise tests within the literature. The lack of such data prompted the development of the Birmingham ISWT tool to provide more insight into ISWT results gained and identify those that would benefit from an exercise intervention. We developed the tool incorporating published equations that predict VO_2 peak for distance achieved in an ISWT (Fernanda-PaedPul-2019) and compared this to published normal values for VO_2 peak by age and sex (Ten-Harkel-EurJCardiovasc-2011). The tool provides thresholds that enable a patient's results to be rated as green (predicted Z score $\geq$-1), amber (predicted Z score -1 to -2) or red (predicted Z score <-2) based on their ISWT distance.

Methods The tool was used to evaluate the most recent ISWTs completed for all CF patients attending our centre aged 8years and over (n=112).

Results 112 ISWTs were completed in our patient group. 65 of the 112 of the tests completed were deemed either maximal (n=52) or non-maximal but the patient completed all 15 levels (n=13) and could be evaluated using the tool, with 49 rated as green, 12 amber and 4 red. In those rated amber or red, 9 stopped due to leg fatigue, 3 due to difficulty in breathing and 4 for either safety or unknown factors. The remaining 47 results were assessed as non-maximal and therefore not evaluated with 35 stopping for safety issues, 4 technical issues, 3 because of foot/knee/back pain and 5 for unknown factors.

Conclusions We have shown that the Birmingham ISWT tool proved easy and quick to use and enabled us to highlight those that would benefit from intervention. 75% of our cohort had good levels of fitness. Leg fatigue was the most common reason for stopping the test rather than shortness of breath. Future plans include validating the tool and developing targeted interventions to improve physical fitness in children with CF.

P117 HBA1C MONITORING IN PATIENTS WITH CYSTIC FIBROSIS RELATED DIABETES (CFRD) DURING COVID 19 PANDEMIC

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10.1136/thorax-2021-BTSabstracts.226

Introduction Cystic fibrosis (CF) affects the pancreas, particularly the β-cells, leading to cystic fibrosis-related diabetes (CFRD) due to insulin deficiency. There is a lack of UK national guidance on how often HbA1C should be monitored. American Diabetes Association (ADA) recommends HbA1c should be monitored quarterly for patients with CFRD.[1] For most patients with CFRD, the HbA1C treatment goal is <7% to reduce the risk of microvascular complications.[1]

We analysed clinical data for all patients with CFRD under Bristol Adult Cystic Fibrosis Centre (BACFC) over 2 years to review HbA1C monitoring in patients with CFRD.

Objectives Review if HbA1C is measured quarterly.

Review if HbA1C target range is achieved.

Methods 83 cases with known CFRD were included. Retrospective data was collected from CF database and ICE, recorded on excel spread sheet with patient identifiers coded and audited against ADA position statement.

Results HbA1C value of <7% (<53mmol/mol) was considered as optimal control. In 2019, 16% (N=13/83) had HbA1C measured 3 times a year which dropped to 10% (N=8/83) in 2020. In 2019, 46.98% (N=39/83) had HbA1C checked once a year whereas in 2020 this number was 38.55%(N=32/83). In 2019, 50%(N=42/83) had optimal HbA1C control; the number dropped to 42% (N=35/83) in 2020. Almost half of the patients i.e. 51.8% (N=43/83) and 49.3% (N=41/83) were seen by diabetes team in 2019 and 2020 respectively.

CONCLUSION A small number of our patients had HbA1C checked quarterly and almost half of them had their HbA1C in the target range. Adherence to ADA guidance was reduced during the COVID-19 pandemic in 2020, due to shielding and reduced face to face clinics. Almost half of the patients were seen by diabetes team and this number was not changed in 2020, although the reviews were not face to face. Action plan devised to improve service and develop a local guideline.

Developing a national guideline for CFRD monitoring should be considered, taking in to account newer technologies for diabetes monitoring.

Abstract P117 Table 1

S. No	Standard/Criteria	Results
1	HbA1C measurement is recommended quarterly for patients with CFRD	10%(8/83)
2	For most patients with CFRD, the A1C treatment goal is <7% to reduce the risk of microvascular complications	42%(35/83)

REFERENCE

1. A Position statement of the American Diabetes Association and a Clinical practice guideline of the Cystic Fibrosis Foundation.

P118 THE ROLE OF PAEDIATRIC RESPIRATORY NURSE SPECIALIST IN MANAGEMENT OF NON-CF BRONCHIECTASIS

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10.1136/thorax-2021-BTSabstracts.227

Background BTS 2010 bronchiectasis guideline recommends multidisciplinary care. Nurses play a vital role in bronchiectasis management. In paediatric bronchiectasis, the role of paediatric respiratory nurse specialist (RNS) is understated in literature. An informal survey asking 287 health professionals who were members of a national group showed no dedicated bronchiectasis RNS in any UK region. In 2019, RNS was allocated to take a more active role to support the paediatric bronchiectasis multi-disciplinary team (MDT), education and transition (0.6 WTE) at our centre.

Objective To appraise the current RNS role at a specialist paediatric bronchiectasis centre.

Method Prospective review of RNS role and time spent in bronchiectasis management over a 12 month period.

Results 93 CT-diagnosed bronchiectasis patients (M43:F50) with a median age of 10.05 (range:3.6–16.5) years were cared for during that time. 136 hours were spent by the RNS in supporting children and young people and families with bronchiectasis. Over 12 months, the services provided by RNSs included:

- Attendance to monthly MDT clinics (4hours per clinic) to provided support, education, and advice.
- Telephonic reviews and advice (4hours)
- Admission avoidance following remote RNS input=7 patients
- 2 patients identified suitable for home IV programme were supported (out of 9 needing IV's)
- 35 hours were spent on service development including database setup and entry.

Conclusion The RNS can support children and young people with emphasis on education, promoting adherence, remote reviews during exacerbations leading to reduced admissions, development of home treatment programmes and support transition. Nurse-led outpatient clinics can facilitate annual reviews and education. Future work involves a more formal survey to review the paediatric bronchiectasis nurses services within the UK, to develop such clinics further and a network approach with the district hospitals in West Midlands and evaluating the feedback from the families.

REFERENCE

1. British Thoracic Society guideline for non-CF bronchiectasis. *Thorax*, 2010;**65**:1–58.

P119 BREATHING PATTERN DYSFUNCTION IN PRIMARY CILIARY DYSKINESIA: MYTH OR REALITY?

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10.1136/thorax-2021-BTSabstracts.228

Background Breathing pattern dysfunction (BPD) is common in patients with obstructive lung disease, e.g., over 50% of patients with severe asthma show evidence of BPD. BPD is also known to affect quality of Life (QoL). Despite disparities

Abstract P119 Table 1

	n	Gender	Age	BPAT	RR	D-12	SNOT-22	EQ5D5L	EQ5D-5L Health
				max=14*		max=36*	max=110*	max=25*	max=100%**
A									
Mean	7	5F/2M	28	5.42	15	15.43	49.14	2.57	68
±SD			7.1	0.79	4.12	10.37	20.97	2.23	15.75
B									
Mean	10	5F/5M	31	2	14.5	2.7	26.5	0.56	75.78
±SD			21	0.82	3.57	2	12.14	1.13	18.41
p=		0.2	0.37	<0.00001	0.4	0.0008	0.0064	0.016	0.19

data expressed as mean ±SD;
RR=respiratory rate; *higher score=worse; **higher score=better

in definition and measurement, the Breathing Pattern Assessment Tool (BPAT)[1] is increasingly being used to identify BPD. At our specialist PCD centre, we considered the relationship between possible BPD and breathlessness, sino-nasal symptoms and QoL.

Method 17 stable adult PCD patients attending virtual appointments provided lung function data using a hand-held spirometer. BPD and breathlessness were measured using the BPAT (therapist-observed) and Dyspnoea 12 (D12), a patient-reported questionnaire; patients also completed the SNOT-22, which examines the impact of chronic rhinosinusitis on well-being, and a generic QoL measure, the EQ5D-5L. Data from patients whose BPAT score was > 4 (group A), indicating likely BPD[1], were compared with those whose BPAT was < 4 (Group B).

Results Age and gender distribution did not differ substantively between groups. We observed that 7/17 patients had BPD; these patients had significantly higher scores for D12, SNOT-22 and EQ5D-5L (function) suggesting greater problems with breathing and rhinosinusitis, and lower QoL (table 1). However, there were no significant differences in lung function between groups A and B respectively: FEV_1 (2.77l vs 2.64l; p=0.42), FEV_1%pred (76.4% vs 71.4%; p=0.35), FVC (3.65l vs 3.72; p=0.46), FVC%pred (84.9% vs 81.6; p=0.36), FEV_1/FVC (0.78 vs 0.68; p=0.12) and in EQ5D-5L%health (68% vs 76%; p=0.19).

Discussion These data suggest for the first time, that BPD is likely found in PCD, even when lung function is reasonably well maintained. The difficulties in breathing identified maybe associated with chronic rhinosinusitis and impact on patients' functional QoL. Overall perception of QoL did not differ between groups, but was only 70% of perceived maximum. Further data are needed although these results suggest the need to screen patients for BPD, target nasal symptoms aggressively and provide breathing re-education techniques.

REFERENCE

1. Todd S, Walsted E, Grillo L, *et al*. Novel assessment tool to detect breathing pattern disorder in patients with refractory asthma. *Respirology* 2017. doi:10.1111/resp.13173

Improving care pathways in adults and children

P120 THE EFFECT OF MEDICAL FACE MASK ON ADOLESCENT CHILDREN'S OXYGEN SATURATION DURING 6-MINUTE WALK TEST

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Aims The World Health Organization recommends that face masks are used for children aged six years and older. Children in the UK are now attending schools using face coverings and undertaking mild to moderate activity with the face covering on. We aim to study the effect of face masks on SpO2 levels of healthy adolescents with a 6-minute walk test (6MWT).

Material and Methods 11 healthy adolescent children (16–17 years) undertook the 6-minute walk test with and without a medical mask (Type IIR, triple ply) and SpO2 levels were measured with a standard commercially available pulse oximeter. A pre-walk test screening questionnaire was used to exclude children with co-morbidities. None of the screened participants needed to be excluded. Measurements included screening blood pressure, SpO2, pulse rate, walking distance, breathlessness and fatigue.

Results The average post 6MWT SpO2 without a mask (96.6 ± 1.43) was higher than with a mask (94.8 ± 4.05) but this was not statistically significant (t-Test p value 0.17). The average distance travelled without a mask (683.4 ± 64.2 metres) was greater than with a mask (675.45 ± 52 metres), again this was not a statistically significant difference (t-Test p value 0.75).

Conclusion Concerns have been raised regarding the safety of the use of face masks.[1] A review regarding the impact of face masks on children has suggested the need for further studies.[2] In this study we have found that the use of medical face masks does not cause a significant drop in oxygen saturations during 6MWT in healthy adolescent children.

This work is a pilot study as part of a sixth form Biology extended essay, all participants signed a written consent form.

REFERENCES

1. Kisielinski K, Giboni P, Prescher A, Klosterhalfen B, Graessel D, Funken S, Kempski O, Hirsch O. Is a mask that covers the mouth and nose free from undesirable side effects in everyday use and free of potential hazards? *Int J Environ Res Public Health*. 2021 Apr 20;**18**(8):4344.
2. Eberhart M, Orthaber S, Kerbl R. The impact of face masks on children-A mini review. *Acta Paediatr*. 2021 Jun;**110**(6):1778–1783.

P121 DOES METHACHOLINE CHALLENGE TEST IMPROVE ASTHMA DIAGNOSTIC CERTAINTY IN CHILDREN AGE 5–16YR?

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Introduction Current UK guidance (NICE) for diagnosing asthma in children 5–16yrs involves sequential lung function testing in a complex algorithm (spirometry; bronchodilator reversibility if spirometry shows obstructions; FeNO; PEFv). This results in three diagnostic outcomes: asthma, not asthma or suspect asthma, with children requiring at least 2 positive tests to be assigned a diagnosis of asthma. Bronchial challenge testing (BCT) is not currently recommended in children but is in adults when there is diagnostic uncertainty.

We hypothesised that methacholine BCT (BCTmeth) is feasible in children >5 years and that the results can reduce the number of children labelled 'suspect asthma'.

Methods Children aged 5–16 years with suspected asthma (symptoms of wheeze, cough, breathlessness) were referred into the RADicA (Rapid Access Diagnostics in Asthma) Study. All attempted lung function testing (spirometry with bronchodilator reversibility, FeNO, PEFv and BCTmeth). Using the NICE algorithm, participants were assigned as asthma, not asthma or suspect asthma. BCTmeth were classed as positive when PD20 was <0.20mg, and children's asthma status was reassessed with this result.

Results 53 children (mean age 9.5yr [SD 3.4]; 25 male) attempted all tests. 8 children (mean age 8.75yrs [SD 3.6]; 4 male) did not complete BCTmeth; 2 children's baseline spirometry was classed as obstructed prior to BCTmeth, 1 had taken salbutamol prior to BCTmeth and 5 had inconsistent baseline spirometry, these were excluded from further analysis.

Abstract P121 Table 1 Number of children classed as asthma, not asthma and suspect asthma before and after BCTmeth

	Using NICE lung function algorithm N (%)	Using NICE lung function algorithm AND BCTmeth N (%)
Asthma	7 (15.5%)	13 (28.8%)
Not asthma	29 (64.4%)	30 (66.6%)
Suspect asthma	8 (17.7%)	1 (2.2%)
Missing evidence	1 (2.2%)	1 (2.2%)
Total	45	45

45 children (mean age 9.5yrs [SD3.4], 21 male) successfully completed BCTmeth; of these children 20 had a positive test (PD20 <0.15mg-0.199mg). 1 child was unable to complete FeNO and/or PEFv (positive BCTmeth) and classed as 'missing evidence'. Using the NICE algorithm, 7 children were diagnosed with asthma (5 positive BCTmeth) and 29 without asthma (7 positive BCTmeth). Of the 8 children with suspect asthma; 6 had a positive BCTmeth and could be given a diagnosis of asthma, 1 had a negative test and was reclassed as not asthma and 1 had a borderline result (PD20 0.214mg) so remained in the suspect asthma group.

Conclusion BCTmeth is feasible with 85% of children successfully completing the challenge. Assessing airway hyperresponsiveness with BCTmeth reduced diagnostic uncertainty in children.

P122 AN EVALUATION OF THE TRANSITION SERVICE BETWEEN PAEDIATRIC AND ADULT REGIONAL SEVERE ASTHMA CARE IN LEEDS

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10.1136/thorax-2021-BTSabstracts.231

Introduction Over one million children have asthma in the UK and a recognised need for support transitioning into adult services. Poor transition with uncoordinated processes risks disengagement from services, and poorer health outcomes. Transition processes are embedded for children with diabetes and transplantation, but less established for severe asthma. We aim to explore the patient experience of transition for young people with severe asthma and evaluate the impact of a transition service in reducing emergency department (ED) presentations with asthma.

Methods A questionnaire containing Likert scale and free text questions was developed based on the 'ready, steady, go'[1] programme. This was given to patients aged 14–15 years attending asthma transition clinic.

ED records for the years 2016–2018 were reviewed to identify patients aged 16–19 that presented with asthma symptoms. These data were cross-referenced with the registry of patients known to the transition service and demographic data was analysed.

Results 9 patients completed questionnaires, with two thirds of respondents reporting confidence about the transition process. All respondents reported good knowledge of their condition and treatment. Key themes that emerged were concerns about potential limits asthma may place upon their future achievements and a desire for understanding of management of their asthma during the transition process.

During the years analysed for ED attendances, none (0%) of the 17 children who underwent transition through the service presented to the emergency department with asthma. During that time, 131 young people (mean (SD) age 17.5 (0.7) years, 56% female) presented to the emergency department with asthma who were not known to the transition service.

Conclusion The transition service for young people with severe asthma is successful in preventing emergency department attendances with asthma symptoms. We have identified a need to expand the transition service to young people not already known to the regional severe asthma service.

REFERENCE
1. Nagra A, McGinnity PM, Davis N, et al. 2015. Implementing transition: ready steady go. Arch Dis Child Educ Pract Ed 2015;**0**:1–8.

P123 DON'T FORGET YOUR PE KIT – IMPROVING THROMBOLYSIS DECISION MAKING IN A DISTRICT GENERAL HOSPITAL (DGH)

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10.1136/thorax-2021-BTSabstracts.232

Introduction Multiple patients with massive/submassive pulmonary emboli (PE) were admitted in a short timeframe to a DGH. Inconsistency in management was noted, prompting discussion surrounding thrombolysis decisions.

Methods All PE-related admissions to the Cardiac Monitoring Unit (CMU) between 2016–2020 were reviewed. Thrombolysis decision, relevant test results and outcomes were recorded and their concordance to local and national recommendations and guidelines were analysed.

Junior doctors were surveyed. Confidence in PE management was assessed, they were asked to select the appropriate management option for 5 clinical scenarios and if a 'bundle' would aid decision-making.

Results 57 patients were admitted over 4 years. 14 had a massive PE and 33 patients had a submassive PE. Of these, 12 (85.7%) and 17 (51.5%) were thrombolysed respectively. Departmental echocardiograms were organised within 24 hours in 74% and follow-up echocardiograms performed in 54%. The pooled mortality at 1 year was 21% with no significant difference between those thrombolysed and those not.

The survey, to which 22 junior doctors responded, demonstrated that 73% described themselves as 'very' or 'fairly' confident in managing massive/submassive PE. There was disparity in case management with the polar options of 'thrombolysis' and 'subcutaneous anticoagulation' being chosen at least once in each scenario.

All respondents supported a bundle. A consent form, information sheet and decision-making flowchart were created with stakeholder input and published locally.

Conclusion We show mostly guideline-concordant practice with the exception of echocardiogram follow up. Variability in opinion amongst juniors, despite perceived confidence, was observed. Bundle creation with respondent and consultant input standardises management and prompts escalation to seniors early to negate overconfidence in complex situations.

P124 IMPROVING SAFE SEDATION PRACTICES IN BRONCHOSCOPY AT A DISTRICT GENERAL HOSPITAL

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10.1136/thorax-2021-BTSabstracts.233

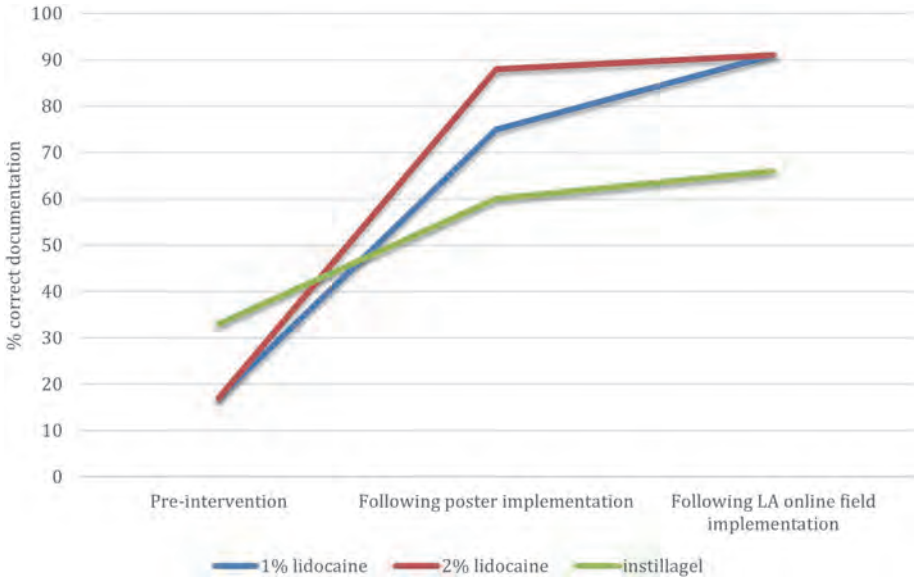
Introduction Procedural sedation and analgesia (PSA) practice varies, with minimal standardisation in bronchoscopy. The British Thoracic Society published Quality Standards in 2014 to ensure high standards of care for all patients undergoing bronchoscopy.

Aims
- Identify areas for improvement in PSA
- Increase PSA awareness amongst bronchoscopists
- Improve use of safe recommended doses of sedation agents
- Improve clarity of documentation

Methodology We performed a retrospective review of 113 bronchoscopy and 59 endobronchial ultrasound (EBUS) reports (September 2019-September 2020). May 2020 was excluded due to COVID19.

Three interventions were implemented:

1. Virtual local departmental teaching to raise awareness of safe PSA.
2. Implementation of a bronchoscopy-suite poster detailing local anaesthetic (LA) dose conversions.



Abstract P124 Figure 1 Correct documentation of LA agents

3. Introduction of specific LA fields on our online bronchoscopy reporting system.

Bronchoscopy and EBUS reports were re-audited following each intervention (total 19 cases).

Results Maximum recommended dose of midazolam in ≥70yrs (3.5mg), was exceeded in 19% of EBUS cases and 5% of bronchoscopy cases pre-intervention. Following virtual teaching, 0% exceeded maximum recommended dose.

Maximum recommended dose of fentanyl (50mcg) was exceeded in 22% of EBUS and 4% of bronchoscopy cases pre-intervention. Following virtual teaching, maximum dose was exceeded in 1.6% of EBUS and 0% of bronchoscopies.

Pre-interventions, 1% and 2% lidocaine use was correctly documented in 17% of procedures and instillagel use was correctly documented in 33% of procedures. Following poster implementation, 1% lidocaine use was correctly documented in 75% of procedures, 2% lidocaine use was correctly documented in 88% of procedures and instillagel use was correctly documented in 60% of procedures. Following LA-field implementation, 1% lidocaine use was correctly documented in 91% of procedures, 2% lidocaine use was correctly documented in 91% of procedures, and instillagel use was correctly documented in 66% of procedures. (figure 1)

Conclusions Virtual teaching for bronchoscopists increased awareness of safe PSA, thus reducing previously exceeded recommended doses of sedatives. Implementation of a bronchoscopy suite poster, and specific recording fields for LA, has improved documentation practices. Methods introduced continue to be used in our trust's bronchoscopy suite.

REFERENCE

1. BTS Quality Standards for Diagnostic Flexible Bronchoscopy in Adults (2014) https://www.brit[1]thoracic.org.uk/document-library/clinical-information/bronchoscopy/bts-quality-standards-for-flexible[1]bronchoscopy-2014

P125 AUDIT OF COMPLICATIONS OF PERCUTANEOUS CT GUIDED LUNG BIOPSIES CARRIED OUT AT ROYAL ALEXANDRA HOSPITAL AND INVERCLYDE ROYAL HOSPITAL IN 2019 AND 2020

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10.1136/thorax-2021-BTSabstracts.234

Background Percutaneous CT guided lung biopsy (PCLB) is used for histological diagnosis of pulmonary disease and is preferred to surgical biopsy due to its fewer complications.

The British Thoracic Society (BTS) recommend that operators audit their practise to calculate complication rates to inform patients about risks. Complication rates should be similar to, or lower than those from the national survey: pneumothorax (20.5% of biopsies), pneumothorax requiring chest drain (3.1%), haemoptysis (5.3%), and death (0.15%).

Aims This audit aims to calculate whether the complication rates of percutaneous CT guided lung biopsy were acceptable when compared to the aforementioned BTS guidelines.

It also aims to ascertain what risk factors there may be for developing a more severe pneumothorax as a consequence of the procedure.

Methods 153 patients had a PCLB at Royal Alexandra and Inverclyde Royal Hospitals. Their biopsy reports and follow up chest X-rays were reviewed for evidence of haemoptysis, pneumothorax, air embolus, or death. Their immediate discharge letters were used to view their hospital stay lengths and to see which patients needed a chest drain inserted during their stay.

Each patient's lesion diameter and the distance that the biopsy needle travelled through the chest wall to reach the lesion were measured.

Complication rates were calculated and compared with the quoted rates. Potential risk factors for a severe pneumothorax were assessed.

Results Pneumothorax rate was 21.6%.

Pneumothorax requiring a chest drain rate was 7.2%.

Haemoptysis rate was 10.5%.

No deaths were reported as a consequence of the procedure.

Patients that developed a pneumothorax requiring a chest drain were on average 4 years older. They had an average 0.6cm greater distance travelled by the needle to the lesion and were 0.4 cm smaller in diameter.

Conclusions Complication rates were acceptable when compared to BTS guidelines.

Older age, smaller lesions, and lesions further from pleura are risk factors for a serious pneumothorax.

P126 AMBULATORY PNEUMOTHORAX WITH THE PLEURAL VENT IN A DGH IN THE NORTH EAST OF ENGLAND

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10.1136/thorax-2021-BTSabstracts.235

Introduction Ambulatory pneumothorax management saves inpatient days and is feasible with the Rocket pleural vent (PV) at the expense of higher rate of complications in primary spontaneous pneumothorax (PSP) (RAMPP study[1]). The HiS-Pec study[2] in secondary spontaneous pneumothorax (SSP) showed that PV was probably dangerous. We have a local service with strict inclusion criteria (WHO PS 0–2, ambulant patients) using the PV.

Methods We retrospectively analysed all pneumothoraces managed with a PV from March 2018-April 2021.

Results 50 patients were identified. Table 1 shows the characteristics of 32 patients with PSP and 16 patients with SSP managed with the PV. The other 2 patients were iatrogenic

Abstract P126 Table 1

	PSP	SSP
Number	32	16
Mean age (years)	30.9	61.5
Mean number of days PV in situ	5.9	4.5
Current tobacco smokers	17	1
Current marijuana smokers	11	0
Ex-smokers	0	15
Never smokers	14	0
Number with Respiratory comorbidity	2	16
Description of comorbidity		
Previous pneumothorax	2	2
COPD	0	12
Asbestosis	0	1
Non specific fibrotic lung disease	0	1
Lung cancer	0	1
Rheumatoid lung disease	0	1

Abstract P126 Table 2

Adverse events (total)	PSP (12)	SSP (2)	Was a change in intervention required?
Description of adverse events			
Re-expansion pulmonary oedema (REPE)	1		No
Pain	5		1 vent was removed, and patient observed
Allergic reaction to dressing	1		ICD inserted
Surgical emphysema (SE) with no kinks or blockage	2	1	3 required ICD
Blockage of PV with fibrin or secretions or kinked on rib, causing SE	3	1	PV in patient with SSP replaced with another. All 2 PSP patients required an ICD

pneumothoraces secondary to image guided biopsies. Table 2 shows the adverse events related to those vents. Total number of bed days saved are 267.

Conclusions Complication rates are comparable RAMPP trial and commoner with PSP patients. There is no indication of the PV being unsafe in SSP, but our cohort is highly selective and thus at risk of significant bias. Our protocol works locally and we are happy to share it if needed.

REFERENCES

1. https://doi.org/10.1016/S0140-6736(20)31043-6
2. https://erj.ersjournals.com/content/early/2020/11/26/13993003.03375-2020

P127 LANCASHIRE AND SOUTH CUMBRIA REGIONAL TRACHEOSTOMY TEAM: ANNUAL IMPACT OF A SPECIALIST COMMISSIONED SERVICE

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10.1136/thorax-2021-BTSabstracts.236

Evidenced annual impact of a specialist commissioned regional tracheostomy team aiming to reduce the risk of community tracheostomies.

There are an increasing number of tracheostomies being inserted nationally with no national framework for ongoing review following discharge to the community setting. This has the potential to result in poor clinical outcomes and ongoing dependence on acute care services and high cost packages of care. Prior to this service innovation, community tracheostomy patients were managed primarily by GP's with very few patients receiving specialist input. We found that this was resulting in repeated hospital admissions, lack of specialist review to assess for weaning potential and due to the lack of tracheostomy competent placements, was causing individuals to be relocated away from their families. £301,000 investment from regional Clinical Commissioning Groups (CCG's) was secured in April 2020 to create a specialist Nurse/Allied Health Professional led team consisting of 2.5 team members: Nurse (Clinical Lead), Physiotherapist and Speech and Language Therapist. Quantitative and qualitative data was collected during the first year of substantive funding to evidence service impact including: number of community decannulations with associated continuing healthcare cost saving, reduced dependence on secondary care, improved access to community placements, hospital admission avoidances and lived patient experiences. A total cost saving of £405,050.68 with an additional cost avoidance of £2,700,000 from acute in-reach decannulations during the first 6-month COVID-19 wave was achieved over this 12-month period. We have demonstrated the positive impact specialist tracheostomy services can have across primary and secondary care with the aim of this service model being used for national service provision pathway developments. Specialist tracheostomy services can achieve huge impact within the community setting both to improve clinical outcomes for this vulnerable patient group and to achieve substantial annual cost saving to the NHS.

P128 DEVELOPMENT OF A PULMONARY NODULE VIRTUAL PATHWAY

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10.1136/thorax-2021-BTSabstracts.237

Introduction Pulmonary nodules are monitored at our hospital as per BTS guidance.[1] Previously, most patients were seen for a new patient appointment and follow-up appointments were planned in anticipation of interval CT scan results. Results would be acted on when the report reached the requesting consultant, with the follow-up appointment postponed if CT findings were stable.

This system had several flaws. The volume of nodules detected made it difficult to see all patients in clinic. Follow-up appointments would often be out of sync with scans leading to unnecessary appointments. As follow-up demand often outstripped capacity, outpatient follow-up did not act as an effective safety-net for problems with reports reaching requestors.

Development of a Virtual Pathway We developed a new pathway, improving several aspects of the system. Patients suitable for the Virtual Pathway are identified by Respiratory consultants based on referrals, CT results or via MDT. Patients are sent an information leaflet about pulmonary nodules with the option of requesting further information, rather than routinely offering new patient appointments. Interval scans are tracked by a database managed by a Specialty Doctor who ensures that scans have been requested, acted on, and patients notified of results.

Outcomes In the first year we tracked 244 follow-up scans, including 136 for nodule surveillance. Other reasons included follow-up of inflammatory change, lymph nodes and anterior mediastinal abnormalities. Only three nodule patients requested a new patient telephone consultation for further information. The database identified several 'near misses', including (1) a requesting consultant name being incorrectly transcribed, leading to the report not reaching the requesting consultant; (2) one overdue scan due to a radiology booking error, and (3) one scan that was not requested. No follow-up appointments were required for patients with stable findings.

Conclusion Development of a Pulmonary Nodule Virtual Pathway, utilising an interval scan database, reduced outpatient appointments whilst improving safety netting of pulmonary nodule surveillance.

REFERENCE

1. Callister M, et al. British thoracic society guidelines for the investigation and management of pulmonary nodules. Thorax 2015;70(S2):ii1–ii54.

P129 GETTING IT RIGHT IN A DIGITAL AGE – ROBUST PATIENT SELECTION TO AN EARLY SUPPORTED DISCHARGE SERVICE

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10.1136/thorax-2021-BTSabstracts.238

Introduction and Objectives Digital technology with capability for virtual ward consultant clinical supervision, DECAF scoring and a trusted assessor model was used to select patients for early supported discharge (ESD). We present here data on the initial three months of the pilot ESD service.

Methods ESD was a joint venture with the combined workforce of established hospital respiratory specialists (Respiratory Support Team; RST) and an expanded community respiratory team (CRT). A robust alert system linked to our electronic prescribing system identified potential patients to the RST (Colclough, 2014). Consultant clinical supervision screened all COPD admissions virtually from the hospital COPD virtual ward; established when an electronic bundle is opened by the RST. The DECAF score 0–1 was used to establish a cohort of patients assessed as safe for ESD (Steer, 2012). DECAF >2 required respiratory consultant approval for discharge to ESD. Advice and guidance was given to support the clinical team decision for suitability to be discharged.

Results In quarter 1 2020 29 patients were referred to ESD out of 161 patients admitted with COPD.

Conclusions ESD is safe and effective using a trusted assessor model supported by digital technology and consultant virtual supervision to screen into this service.

REFERENCES

1. Colclough R. P32 A Novel automated referral system using the electronic prescription of prednisolone >=30 Mg And nebulised bronchodilators to the respiratory specialist team is robust and effective. *Thorax* 2014;**69**(Suppl 2):A91–A91.
2. Steer J, Gibson J, Bourke S. The DECAF score: predicting hospital mortality in exacerbations of chronic obstructive pulmonary disease. http://dx.doi.org/10.1136/thoraxjnl-2012-202103

COVID-19 recovery: predicting long term outcomes

P130 PROGNOSTIC VALUE OF THE INITIAL CHEST COMPUTERISED TOMOGRAPHY SCAN AT ONE YEAR FOLLOWING INFECTION IN AN ETHNICALLY DIVERSE COHORT OF PATIENTS ADMITTED TO HOSPITAL FOR COVID-19

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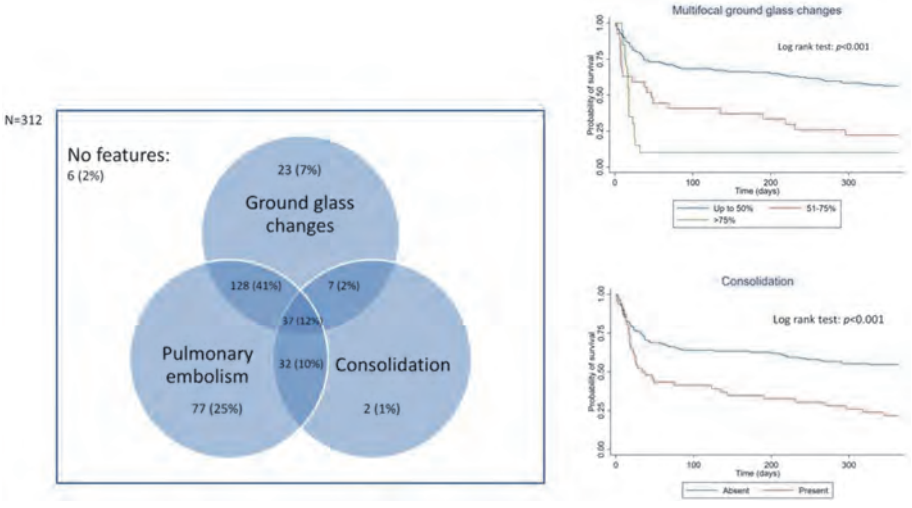
10.1136/thorax-2021-BTSabstracts.239

Background Little is known about computed tomography thorax (CTT) findings in hospitalised patients with COVID-19 of different ethnic groups, as well as their prognostic value following hospitalisation.

Methods Clinical data and the CTTs of patients admitted with COVID-19 between 9th March and 27th April 2020 to University Hospitals of Leicester NHS Trust were recorded and reviewed. CTTs were reviewed by two independent radiologists, blind to clinical data for ground glass opacities (absent, mild, moderate and severe), consolidation (absent. present) and pulmonary emboli (PE; absent, present). The main outcome of interest was all-cause mortality by April 12th 2021. Cox proportional hazards regression was used to investigate the relation between variables and all-cause mortality.

Results 312 patients were enrolled; median age 65 (IQR 51–77); 234 (75%) were White; 42 (14%) Asian; 9 (6%) Black and 17 (5%) were from other ethnic minority groups. 195 (63%) of patients had multifocal ground glass changes on



Abstract P130 Figure 1 Features of COVID-19 on the CT were very common in hospitalised patients and were related to all-cause mortality one year following hospitalisation

CTT; 78 (25%) had consolidation and 274 (88%) had PE (figure 1). Patients from Asian, Black and Other ethnic minority groups had a higher prevalence and severity of multifocal ground glass changes on CTT compared to those from White groups (severe ground glass changes for White: 15 [6%]. Asian: 6 [14%], Black 2 [11%], Other 8 [47%], $p<0.001$). After one year, 104 (33%) patients died. On univariable analysis, multifocal ground glass changes and consolidation were related to all-cause mortality at one year. In a model consisting of age; ethnicity; gender; number of comorbidities; admission National Early Warning Score-2; admission lymphocyte count; C-reactive protein and urea, the addition of worsening ground glass changes on CTT were related to all-cause mortality at one year (aHR: 1.29, 95% CI 1.08–1.55, $p=0.005$ and Figure) and boosted the model's cumulative discrimination (Harrell's c statistic 0.75 from 0.69, $p<0.001$).

Conclusion Evidence of COVID-19 pneumonia on CTT is more common and severe in patients from ethnic minority groups and is independently associated with worse prognosis following hospitalisation.

P131 THE DEGREE OF ACUTE RESPIRATORY SUPPORT WITH COVID-19 PNEUMONIA, SMOKING STATUS ON ADMISSION AND NON-RESOLVING CT FEATURES AT THREE MONTHS- ARE THERE LINKS?

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10.1136/thorax-2021-BTSabstracts.240

Introduction and Objectives BTS guidelines suggest radiological follow up at 12 weeks for patients with COVID-19 associated pneumonia. It is suggested development of post-covid fibrotic changes is more prevalent with severity of illness.[1] We compared illness severity based on maximal respiratory support with non-resolving changes on CT imaging at >12 weeks. Smoking status at time of admission was also collected.

Methods Retrospective analysis of COVID-19 patients surviving to follow up identified either by CVCX1 coded CXR or CVCX2 coded CXR and positive PCR between March 2020-January 2021. This identified 912 patients reviewed at 12 weeks with CXR ± CT imaging. 50/912 patients (5.5%) had evidence of either established fibrotic change or ongoing pneumonitis on CT. Imaging was reviewed by radiologist using suggested scoring system for Covid-19 follow-up 2 based on sum of 0–5 severity in 5 lobes (total 0–25) for markers of fibrosis/pneumonitis.

Results Comparison is shown in table 1. All patients requiring more than 60% oxygen therapy received advanced respiratory support. 10/50 patients (20%) required no supplementary oxygen and 6/10 were not admitted to hospital. Comparison mean fibrosis score; IPPV-18.6, CPAP/HFNO-9.23, RA- 8.5. There were no current smokers in the follow-up cohort, 24 ex-smokers.

Conclusions We noted significant risk for developing post-Covid pneumonic fibrotic changes even in clinically mild cases. With SpO2 at times of peak incidence being main indicator for CXR and/or admission we surmise there may be a significant unrecognized population without an initial CXR to prompt follow-up. It is not clear whether these patients will develop significant symptoms to prompt future investigations and what impact this might have. No patients developing ongoing CT changes were current smokers- a topic we suggest for further study and correlation.

Abstract P131 Table 1

Max FiO2/Resp support	21%	≤ 35%	40%≤ 60%	CPAP/ HFNO	IPPV
No. patients	10	8	11	16	5
Age (mean)	62.1	71.6	62.5	62.7	51.6
Mean fibrosis score (0–25)	8.5	7.0	11.6	9.23	18.6
Mean pneumonitis score (0–25)	6.7	9.6	7.5	15.2	22.6
M: F ratio	7:3	3:5	6:5	10:6	4:1
Ex-smokers*%	50	75	64	33	20
Current smokers*	0	0	0	0	0

*smoking status at time of admission was available on 42/50 patients

REFERENCES

1. McGroder CF, *et al*. Pulmonary fibrosis 4 months after COVID-19 is associated with severity of illness and blood leucocyte telomere length. *Thorax* **29** April 2021. doi:10.1136/thoraxjnl-2021-217031
2. Xiaoyu Han, et al. Six-month follow-up chest CT findings after severe COVID-19 pneumonia. Radiology 2021;**299**:1, E177–E186.

P132 INTERMEDIATE FOLLOW UP OF RADIOLOGICAL INTERSTITIAL CHANGES FOR COVID-19 PATIENTS OVER THE FIRST YEAR POST DISCHARGE: A LONGITUDINAL STUDY

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10.1136/thorax-2021-BTSabstracts.241

Introduction COVID-19 follow up has become a high priority, with clear evidence that significant proportions of survivors continue to have symptoms at follow up. It has been demonstrated that 56% of those with severe COVID had lung diffusion (DLCO) impairment and more than 50% had radiographic abnormalities at 6 month follow up.[1] However there is limited evidence at present how these abnormalities change over time beyond the first assessment.

We present CT imaging results for patients discharged after COVID-19 infection, at various time points over the first year after discharge. Pulmonary function tests for this cohort are currently being analysed.

Methods 387 COVID-19 patients were followed up post discharge. There are 81 baseline CTs available for analysis, and of these 35 had a repeat CT thorax prior to second assessment based on clinical need.

All the CT images were independently assessed by a Thoracic Radiologist using BSTI criteria[2] and compared to subsequent CTs for the same patient. A higher proportion of those with PCVCT3 had repeat CT imaging as expected due to clinical need.

Discussion On repeat assessment, all patients had significantly improved respiratory symptom scores (MRC and CAT score). Only 3 of 35 patients had progressive fibrosis on the second scan, all of whom had PCVCT3 on initial imaging. None of those who had PCVCT1 or 2 on initial imaging went on to develop fibrosis and all showed improvement on subsequent imaging.

Abstract P132 Table 1 Follow up symptoms and radiological findings at first and second assessment post discharge. Analysed by Wilcoxon Rank Sum, median (range)

	First timepoint	Second timepoint	P value
Clinic assessment (months post discharge)	1.5 (1–3)	9 (6–12)	
CT scan (months post discharge)	2.5 (1–4)	8 (6–12)	
MRC score	3 (2–4)	1 (1–3)	<0.0001
CAT score	12 (7–18)	6 (4–14)	0.002
Numbers of CT performed	81	35	
Numbers of CTs performed for isolated ground glass abnormalities (PCVCT1+2)	47	13	
Numbers of CTs performed for fibrosis plus ground glass changes (PCVCT3)	34	22	

Conclusion Those patients found to have PCVCT3 changes on initial CT should receive long term follow up as a proportion (approximately 9%) of them may develop progressive fibrotic changes. However this is likely to only represent less than 1% of all COVID-19 patients discharged from hospital. Longer term follow up is needed to determine the ongoing trajectory of these interstitial changes. These patients may potentially benefit from clinical trials in the future for the use of antifibrotics.

REFERENCES

1. Huang C, *et al*. 6-month consequences of COVID-19 in patients discharged from hospital: a cohort study. *Lancet* 2021;**397**:220–32.
2. BSTI. BSTI Post-COVID-19 CT Report Codes. *BSTI* 22-May-2020.

P133 MEASURING OXYGEN SATURATION ON FOLLOW UP CHEST X-RAY AND RESOLUTION OF RADIOLOGICAL CHANGES AT 6 TO 12 WEEKS POST COVID PNEUMONITIS

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10.1136/thorax-2021-BTSabstracts.242

Introduction Recovery course post COVID-19 pneumonia remains poorly understood. This study aims to present data on clinical and radiological characteristics of COVID-19 patients admitted to the hospital, as well as their follow-up after discharge. Data collected before any official guidelines however it was in line with subsequent models recommended by the British Thoracic Society.[1]

Methods The study included all COVID-19 patients admitted between mid-March and September 2020 with chest X-Ray (CXR) changes consistent with COVID pneumonitis. Patients had a virtual respiratory clinic review, with a repeat CXR and oxygen saturation (SpO2), 6 to 12 weeks after discharge. Radiographers were trained in a novel role to measure SpO2 (with target SpO2 and local escalation policy).

Results 302 patients were admitted with COVID during the study period, of these 207 (68.5%) had radiological changes consistent with COVID pneumonitis. Ethnicity data was available for 110 (53%) patients. 86% of patients were Caucasians while 14% patients were of Black, Asian and minority ethnic (BAME) background. The median length of stay in the hospital was 8 days (IQR: 13). Smoking status was recorded for 97 (46%) patients. 54 out of 97 (55%) had a history of smoking. 79% of patients had normal follow-up CXR. 33 (21%) patients had persistent abnormalities including residual infiltrates, atelectasis, pleural effusion and fibrotic changes. Patients with normal follow-up CXR were younger than those with persistent changes ($p < 0.05$). SpO2 was checked for 95 out of 155 patients (61%). At the time of follow-up CXR, 92 patients had SpO2 >92% while 3 patients were found to have SpO2 <92%. The virtual screening clinic appointment take-up rate was 83% (N: 129).

Abstract P133 Table 1 Characteristics and outcome of patients with COVID-19 on admission and follow up

	N	Males	Females	Mean age (years)	SD
Total admitted patients*	302	165	137	64	20.65
• Patients with abnormal CXR on admission	207	124	83	67.5	16.74
• Patients with normal CXR on admission	73	31	42	62.9	20.71
• No CXR available at admission	22	10	12	65	22.42
Follow up CXR**					
• Follow up CXR done	155	93	62	65	24
• Follow up CXR normal/baseline changes	122	70	52	62.7	15.8
• Follow up CXR abnormal	33	23	10	68.3	13.6

*Total local population in Guildford and Waverly 225,000 as per 2017 census.
** 6–12 weeks follow up CXR was not done in 52 patients due to multiple patient factors (e.g. mortality, patient did not attend). Mortality rate 7% (N: 21) at time of data collection.

Conclusion Our data shows that the majority of patients with COVID pneumonitis had a normal CXR at 6–12 weeks post discharge. However, a significant proportion of patients still have on-going radiological changes. There was no correlation between target SpO2 and ongoing radiological changes. Patients with normal follow-up CXR were significantly younger than those with persistent changes. We continue to study this group of patients and post COVID sequelae.

REFERENCE

1. https://www.brit-thoracic.org.uk/covid-19/covid-19-information-for-the-respiratory-community/

P134 HEALTH DEPRIVATION AND POST-COVID FIBROSIS: IS THERE A RELATIONSHIP AND WHAT IS THE LONG-TERM IMPACT?

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10.1136/thorax-2021-BTSabstracts.243

Introduction and Objectives Health inequalities are associated with worse outcomes of COVID-19 illness.[1] Health deprivation and disability is one domain within the Index of Multiple Deprivation (IMD). We investigated potential correlation between health deprivation and development of new fibrosis in COVID-19 survivors within a mixed catchment area in NW England in which 35% of neighbourhoods are within the 10% most deprived decile for health and disability.

Methods Retrospective analysis of patients identified between March 2020 and January 2021 with either CVCX1 coded

Abstract P134 Table 1

	10% most deprived	Other
Total	20 (43%)	26 (57%)
Male sex	65%	54%
Average age (years)	62.3	62.6
Maximal Fi02 < 0.6	13 (65%)	9 (35%)
ITU admission	4 (20%)	10 (38%)
T2DM	6 (30%)	3 (12%)
Ex-smoker	13 (65%)	11 (42%)
Average score fibrosis	10.06	10.14

CXR or CVCX2 code with positive PCR test for COVID-19, who survived to follow-up at 3 months. Of 912 patients identified, 46 (5%) had new fibrotic changes on CT. Imaging was reviewed by a radiologist using suggested scoring system for COVID-19 follow-up [2] based on sum of 0–5 severity in 5 lobes (total 0–25) for markers of fibrosis. Deprivation decile was captured from patient postcode.

Results 42/46 (91%) lived in a neighbourhood within the 50% most deprived for health and disability in England; 20 (43%) within the 10% most deprived. Comparison is shown in table 1.

Conclusions We have shown patients surviving COVID-19 who developed new fibrosis are significantly more likely to live within a deprived postcode. Patients within the 10% most deprived postcodes for health and disability are more likely to be male and ex-smokers. We also noted patients developing fibrotic changes on CT within lowest 10% for deprivation had lower rates of ITU admission and required lower FiO2 (indicating less severe disease) but with equivalent radiological findings to those within less deprived areas. Severe deprivation may in itself increase risk of developing long-term respiratory complications from COVID-19, propagating the ongoing cycle of health and deprivation.

REFERENCES

1. Marmot M, et al. Build Back Fairer: The COVID-19 Marmot Review. The Pandemic, Socioeconomic and Health Inequalities in England. [Internet] London: Institute of Health Equity; 2020. Available from https://www.health.org.uk/sites/default/files/upload/publications/2020/Build-back-fairer-the-COVID-19-Marmot-review.pdf
2. Han X, *et al*. Six-month Follow-up Chest CT Findings after Severe COVID-19 Pneumonia. *Radiology* 2021 Jan 26;**299**(1):E177–E186.

P135 CLINICAL, FUNCTIONAL AND PSYCHOLOGICAL CHARACTERISTICS OF SURVIVORS OF SEVERE COVID-19 PNEUMONIA: A COMPARISON OF OUTCOMES FROM THE FIRST AND SECOND WAVES

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Introduction and Objectives The UK has experienced two major waves of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infections, peaking in April 2020 (Wave 1) and January 2021 (Wave 2). Critical care survival rates in

Abstract P135 Table 1 Patient demographics, self-reported scores and functional test results by wave

	1st wave	2nd wave	p-value
Demographics	**n=167**	**n=141**	
Age	59±13	58±12	0.564
Female	60 (35.93; 28.94–43.40)	62 (43.97; 35.97–52.22)	0.15
BMI (kg/m^2)	30.5 (26.6–35.2)	32.1 (28.5–37.9)	0.009 **
BAME	115 (69.7; 62.39–76.32)	72 (59.5; 50.62–67.94)	0.073
Number of comorbidities	2 (1–3)	2 (1–3)	0.144
Patients Receiving Drugs			
Dexamethasone	11 (6.63; 3.57–11.17)	138 (97.87; 94.43–99.40)	<0.001 ***
Remdesivir	18 (10.84; 6.79–16.24)	81 (57.45; 49.20–65.39)	<0.001 ***
Other Immunomodulator	2 (1.20; 0.25–3.81)	31 (21.99; 15.76–29.35)	<0.001 ***
Questionnaire Scores	**n=164**	**n=132**	
NRS Breathlessness	2 (0–5)	3 (0–5)	0.153
≥4	56 (34.78; 27.75–42.36)	52 (37.14; 29.47–45.34)	0.67
NRS Cough	0 (0–2)	0 (0–3)	0.439
≥4	17 (10.56; 6.52–16.00)	18 (13.64; 8.59–20.26)	0.419
NRS Fatigue	3 (0–5)	3 (0–5)	0.867
≥4	65 (40.63; 33.24–48.35)	48 (36.92; 28.99–45.43)	0.52
NRS Pain	0 (0–5)	1 (0–3)	0.682
≥4	44 (27.50; 21.03–34.78)	30 (23.08; 16.48–30.86)	0.39
NRS Sleep disturbance	2 (0–5)	2 (0–5)	0.558
≥4	52 (32.50; 25.61–40.02)	49 (37.40; 29.47–45.89)	0.382
Pre-COVID-19 mMRC	1 (0–2)	1 (1–2)	0.478
Post-COVID-19 mMRC	0 (0–1)	0 (0–1)	0.329
Post-COVID-19 mMRC ≥2	66 (40.99; 33.61–48.70)	49 (38.58; 30.45–47.23)	0.678
PCFS	2 (0–3)	1 (0–2)	0.055
PCFS ≥2	80 (50.00; 42.31–57.69)	51 (42.15; 33.62–51.05)	0.191
PHQ-9 ≥10	32 (20.38; 14.66–27.19)	29 (23.02; 16.33–30.92)	0.592
GAD-7 ≥10	34 (21.38; 15.56–28.24)	16 (12.80; 7.81- 19.49)	0.059
TSQ ≥6	43 (27.56; 21.01–34.94)	27 (22.31; 15.60–30.33)	0.319
Functional Tests	**n=160**	**n=139**	
4MGS <0.8 (ms^{-1})	67 (42.41; 34.89–50.19)	47 (35.07; 27.38–43.40)	0.201
1STS repetitions	18 (12–23)	17 (12–21)	0.460
<2.5 percentile	96 (60.00; 52.29–67.36)	108 (77.70; 70.25–84.00)	0.011 *
Desaturation ≥4%	52 (34.67; 27.40–42.52)	42 (32.31; 24.73–40.67)	0.677

Parametric data are presented as mean ± standard deviation, non-parametric data are presented as median (interquartile range) or frequency (proportion; 95% confidence interval). Statistical significance indicated by * (p<0.05), ** (p<0.01), *** (p<0.001). BMI = Body mass index, BAME = Black, Asian or minority ethnic, NRS = Numerical rating scale (0–10), mMRC = modified Medical Research Council for dyspnoea (0–4), PCFS = Post-COVID-19 functional status scale (0–4), PHQ-9 = Patient health questionnaire 9 (0–27), GAD-7 = General Anxiety Disorder-7 scale (0–21), TSQ = Trauma screening questionnaire (0–10), 4MGS = 4-metre gait speed, 1STS = 1-minute sit-to-stand.

severe COVID-19 pneumonia improved towards the latter stages of Wave 1, due in part to implementation of evidence-based interventions such as early administration of dexamethasone. We aimed to compare symptom burden and functional outcomes post-hospitalisation in Wave 1 and Wave 2 patients attending severe post-COVID clinic.

Methods Prospective single-centre observational cohort study. Patients admitted with severe COVID-19 pneumonia (admission duration ≥48 hours, oxygen requirement≥40% or critical care admission) were invited to the severe post-COVID clinic at 6–8 weeks following hospital discharge. Demographics and anthropometrics, inpatient clinical course, patient-reported (symptoms, functional disability, mental health) and physiological outcomes (4-metre gait speed (4MGS), 1-minute sit-to-stand (1STS) repetitions and SpO_2 desaturation) were recorded. Outcomes from patients admitted during Wave 1 (until 31/8/2020) were compared to patients admitted during Wave 2 (after 01/9/2020).

Results Between June 2020 and April 2021, 167 1st wave (W1) and 141 2nd wave survivors (W2) were assessed in clinic at 62 (50–72) and 61 (58–65) days post hospital discharge respectively. Age, gender, ethnicity and multimorbidity was comparable in W1 and W2 (Table 1). Dexamethasone had been administered to 6.6% of W1 and 97.9% of W2 patients. Comparing W2 to W1, length of hospital stay was shorter (10 (7–14) vs 15 (9–38) days, p<0.001), invasive mechanical ventilation (IMV) was less frequent (22.7% vs 37.2%) and IMV duration was shorter (7 (4–12) vs 30 (11–40) days, p<0.001). There were no significant differences in breathlessness, cough, pain, fatigue, 4MGS or 1STS SpO_2 desaturation (table 1). However, 1STS performance (repetitions/min) was below age and gender-adjusted lower limits of normal (<2.5 percentile) in 77.7% of W2 compared to 60.0% of W1 patients (p=0.011).

Conclusion Despite shorter admission duration, and less frequent IMV, the burden of symptoms and functional limitation experienced post-hospitalisation for severe COVID-19 pneumonia was at least as severe during Wave 2 as in Wave 1. Identification of contributing factors and impact on post-COVID rehabilitation outcomes requires further study.

P136 THE RELATIONSHIP BETWEEN SYMPTOMS AND FUNCTIONAL PHYSIOLOGICAL OUTCOMES IN SURVIVORS OF SEVERE COVID-19 PNEUMONIA

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Introduction and Objectives Holistic post-COVID assessment should include physiological testing, however this may be challenging to deliver in accordance with local infection prevention control precautions. The aim of this study was to evaluate associations between patient-reported and physiological measures of recovery following severe COVID-19 pneumonia. The principal objective was to understand whether patient characteristics and symptom scores are predictive of physiological impairment.

Methods This was a prospective single-centre observational study undertaken in the severe COVID-19 follow-up clinic of a South London Hospital. Survivors of severe COVID-19 pneumonia were assessed in clinic at 6 – 8 weeks post hospital discharge. Relationships between symptoms (outcome measures are listed in table 1), 4-metre gait speed (4MGS), and 1-minute sit-to-stand (repetitions/min (1STSreps) and SpO_2% desaturation) were assessed by correlation and multiple regression analysis.

Results Between June 2020-March 2021, 311 patients were assessed in clinic. Mean±SD age 59±13, 60% male, median (IQR) BMI 31.4 (27.5–36.3) kg/m^2). 30% had received invasive mechanical ventilation, 13% received high flow nasal oxygen, 8% received CPAP, 1% received non-invasive ventilation and 48% required facemask oxygen (FMO2) only. At follow-up, 39% breached the clinically-significant threshold for 4MGS (4MGS<0.8m/s) and 66% breached the theshold for 1STS performance (1STSreps <2.5 percentile adjusted for age and gender). 33% desaturated ≥4% during 1STS testing.

Abstract P136 Table 1 Results of correlation analysis

		Correlation analysis					
		4MGS		1STSreps		SpO_2% desaturation	
	Results	r	p-value	r	p-value	r	p-value
Pre-COVID mMRC dyspnoea score	0(0–1)	-0.267**	<0.001	-0.285**	<0.001	-0.108	0.094
Post-COVID mMRC dyspnoea score	1(0–2)	-0.442**	<0.001	-0.457**	<0.001	-0.143*	0.025
NRS breathlessness	3(0–5)	-0.287**	<0.001	-0.406**	<0.001	-0.490	0.445
NRS fatigue	3(0–5)	-0.315**	<0.001	-0.379**	<0.001	-0.190*	0.003
NRS cough	0(0–2)	-0.660	0.292	-0.153*	0.017	0.083	0.194
NRS pain	1(0–4)	-0.278**	<0.001	-0.346**	<0.001	-0.188*	0.003
NRS sleep difficulty	2(0–5)	-0.246**	<0.001	-0.386**	<0.001	-0.122	0.057

Data are presented as median (interquartile range) or frequency (proportion%; 95% confidence interval). SpO_2% desaturation = SpO_2% desaturation from baseline during 1 minute sit to stand test; 1STSreps = repetitions per minute during 1 minute sit to stand test; 4MGS = 4 metre gait speed; mMRC = modified Medical Research Council; NRS = 0 – 10 numerical rating scale; r = Spearman correlation coefficient. *indicates statistical significance at 0.05 level. **indicates statistical significance at 0.001 level.

Correlations between symptoms and outcomes of physiological tests are shown in table 1. Age (beta=-0.007, p<0.001), male gender (beta=0.073, p=035), current mMRC dyspnoea score (beta=-0.107, p<0.001) and pain (beta=-0.017, p-0.020) were independent predictors of 4MGS (overall model fit R^2=0.394, p<0.001). Current mMRC dyspnoea score (beta=-1.274, p=0.019) and use of facemask O_2 as maximal inpatient respiratory support (beta=2.188, p=0.012) were independent predictors of 1STSreps (R^2=0.309, p<0.001). Variation in SpO_2% desaturation during the 1STS was not explained by the regression model (R^2=0.078, p=0.082).

Conclusion Respiratory symptoms were not strong predictors of 4-metre gait speed and 1-minute sit-to-stand test performance. These data highlight the importance of face-to-face testing to objectively assess functional limitation in patients recovering from severe COVID pneumonia.

P137 THE IMPACT OF ETHNICITY ON THE LONG-TERM SEQUELAE OF COVID-19: FOLLOW-UP FROM THE FIRST AND SECOND WAVES IN NORTH LONDON

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Introduction Ethnicity has been reported as a possible risk factor for SARS-CoV-2 infection, with one meta-analysis suggesting individuals from Black, Asian and other minority ethnic (BAME) backgrounds are at increased risk of infection but not necessarily severe infection or death[1]. However, there is little information on whether such individuals are more likely to develop prolonged symptoms after infection or 'Long COVID'.

Methods We established a follow-up clinic to review all individuals admitted to our Trust with COVID-19 and collected data on demographics, symptom burden and mental health outcomes at 8–10 weeks post discharge. We categorised our cohort into four main groups (White, Black, Asian and Other) based on self-reported ethnicity.

Results Between 27/2/20 and 17/2/21, our Trust admitted 2217 adults with COVID-19. Ethnicity data were available for 1806 individuals; 52.9% were White, 16.3% Asian, 12.5% Black and 18.3% from Other ethnic backgrounds. 342 patients died during admission; 63.2% were White, 9.4% Asian, 11.7% Black and 15.8% from Other ethnic backgrounds. More White adults died than expected (p<0.001).

Follow-up was completed on 1107 of 1464 (75.6%) adults discharged. 54.5% were White, 22.8% Asian, 11.7% Black and 11.0% from Other ethnic backgrounds. Table 1 summarises key demographic, admission and follow-up symptoms. Adults from White backgrounds were older and less likely to have diabetes (p<0.001), while Black adults were more likely to have higher BMI, hypertension and chronic kidney disease (p<0.002). There was no difference in admission National Early Warning Score (NEWS2), or number of adults requiring non-invasive respiratory support and intubation.

At follow up, there was no difference between ethnic groups in terms of burden of physical or mental health symptoms, breathlessness score and ability to return to work.

Abstract P137 Table 1 Demographics, admission severity and follow-up symptoms

Variable	White N = 603	Asian N = 252	Black N = 130	Other N = 122	p-value
Age	65 ± 16.5	59 ± 15.4	59 ± 13.9	59 ± 14.7	<0.001
Male (%)	372 (62)	148 (59)	72 (55)	81 (66)	0.28
Index of deprivation*	6 (3–7)	6 (4–8)	5 (3–7)	5 (3–7)	0.03
Body mass index	27.1 (23.5–30.5)	26.0 (23.7 – 29.2)	28.9 (25.9 – 34.7)	26.7 (25.1 – 30.9)	<0.001
Hypertension (%)	244/583 (42)	113/247 (46)	72/125 (58)	40/119 (34)	0.001
Cardiovascular disease (%)	133/415 (32)	45/166 (27)	15/86 (17)	16/73 (22)	0.02
Diabetes (%)	122/583 (21)	80/247 (32)	45/125 (36)	40/119 (34)	<0.001
Respiratory disease (%)	124/416 (30)	39/167 (23)	21/91 (23)	16/70 (23)	0.25
Chronic kidney disease (%)	61/583 (11)	29/247 (12)	27/125 (22)	9/119 (8)	0.002
Any mental health (%)	77/583 (13)	23/247 (9)	8/125 (6)	17/119 (14)	0.08
Smoking history (%)	250/587 (43)	43/244 (18)	44/127 (35)	44/118 (37)	<0.001
Clinical frailty score	3 (2–4)	2 (2–4)	3 (2–4)	3 (2–3)	0.11
NEWS2	4 (2–6)	4.5 (3–6)	5 (3–6)	5 (3–7)	0.3
Respiratory support	80/564 (14)	47/236 (20)	23/116 (20)	21/118 (18)	0.15
Follow-up symptoms					
MRC score*	2 (1–3)	2 (1–3)	2 (1–3)	2 (1–2)	0.61
Cough improved (%)	414/553 (75)	177/232 (76)	85/118 (72)	87/113 (77)	0.8
Fatigue improved (%)	451/552 (82)	193/228 (85)	109/122 (89)	88/115 (77)	0.05
Sleep improved (%)	342/536 (64)	155/228 (68)	76/117 (65)	68/112 (61)	0.57
Burden of symptoms*	1 (0–2)	1 (0–2)	1 (0–2)	1 (0–2)	0.78
Returned to work (%)	142/256 (56)	77/139 (55)	29/64 (45)	41/71 (58)	0.45
Felt back to normal (%)	256/439 (55)	112/186 (60)	62/103 (60)	43/78 (55)	0.87
Positive PHQ-2 (depression screening)	65/580 (11)	40/242 (17)	12/126 (10)	11/116 (10)	0.09
Positive TSQ (post-traumatic stress screening)	42/601 (7)	16/248 (7)	13/130 (10)	8/122 (7)	0.6

*Non-parametric data presented as median ± interquartile range, all other data presented as mean ± standard deviation.

Discussion Our data demonstrate that despite having more co-morbidities associated with worse outcomes, adults from BAME backgrounds who are discharged from hospital following COVID-19 are no more likely to experience symptoms consistent with 'Long COVID'. However, given the increased risk of infection among BAME communities, we must ensure that reducing health inequalities remain central to the UK health agenda.

REFERENCE

1. Sze, *et al*. *EClinicalMedicine* 2020. doi:10.1016/j.eclinm.2020.100630

P138 PROGRESS OF COVID-19 SURVIVORS AND THE IMPACT OF THE INFECTION ON THEIR ABILITY TO RETURN TO WORK

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Background Prior studies have suggested that certain occupations, such as health and social care are associated with a higher risk of severe COVID-19 infections and increased morbidity. Recent data suggests that even patients with mild COVID-19 infection can have persistent symptoms several months after the acute illness has resolved. We sought to assess rates of return-to-work and the impact of severity of COVID-19 infections and morbidity.

Methods Patients discharged with positive COVID-PCR swab between 06/04/2020 and 16/04/2021 from our district general hospital were entered into a registry and systematically followed up by telephone virtual clinic at 4–6 weeks post discharge. Baseline characteristics, smoking status, COVID-19 severity (severe COVID defined as the need for intubation or CPAP), comorbidities and occupation were collected. In the present study only patients aged 18–65 years, and those with complete baseline data were included. At follow up return to work status and morbidity were recorded (severe morbidity defined as the presence of 3 or more symptoms of breathlessness, fatigue, psychological symptoms and sleep disturbance). Interactions between return-to-work status (back at work v not back at work) and severe COVID, and severe morbidity were assessed with Chi-Squared Test. Statistical significance $p<0.05$.

Results In total 254 patients were included (80% Caucasian, median age 56 [lower quartile 47 to upper quartile 63] years, 48% female, 41% current smokers were included. Of these 138 (54%) patients were employed (table 1). In the employed cohort 11% of patients had severe COVID. Follow up data was complete in 30 patients, of whom 58% had returned to work and 50% had severe morbidity. Morbidity at follow up included sleep disturbance (78%), sleep (72%), fatigue (53%) and shortness of breath (42%). There were no significant interactions between return-to-work status and COVID severity at presentation ($p>0.05$) and between return-to-work status and severe morbidity at follow up ($p>0.05$).

Abstract P138 Table 1 Employment status of COVID-19 discharges

N	138
Essential services	41 (30)
Office/admin	37 (27)
Healthcare	16 (12)
Non essential services	15 (11)
Public transport	10 (7)
Enforcement	4 (3)
Heavy Goods Vehicle driver	3 (2)
Carers	2 (1)
Unknown	10 (7)

Conclusion Our preliminary data suggests significant symptom burden within 6 weeks post discharge after a COVID-19 infection admission, which may impact on the ability of patients to return to work. In the present analysis there was no significant interaction between return-to-work status and covid severity.

P139 THE SYMPTOMATOLOGY OF LONG COVID PATIENTS IN CHESHIRE AND MERSEYSIDE

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Background A growing proportion of patients experience ongoing symptoms for more than 12 weeks following an initial COVID-19 illness. Long COVID or post-COVID syndrome is an increasing burden to the NHS. NHS England has mandated the setup of regional long COVID clinics to manage this demand.[1] There is very little understanding of the range of symptoms and the symptom burden to patients.

Aims We describe self-reported symptoms and compare breathlessness and fatigue scoring for patients referred to the Cheshire and Merseyside Long COVID assessment hub, which serves a population of >2.5 million, between February 2021 and April 2021.

Methods Retrospective review of case notes of patients assessed in our virtual Long COVID assessment hub. Data was analysed using paired t-tests. Fatigue was scored on a scale of 0 (no fatigue) to 10 (extreme fatigue). Breathlessness was assessed using Borg breathlessness scale and MRC dyspnoea score.

Results 332 patients were assessed, with the following symptoms described in table 1. We found a significant increase in self-reported Borg breathlessness (4.9 vs 0.2, $p<0.0001$), MRC dyspnoea (2.5 vs 1.1, $p<0.0001$) and fatigue (7.1 vs 0.7, $p<0.0001$) at time of assessment, when compared with reported pre-morbid state.

Discussion Patients experience significant worsening breathlessness and fatigue. This significant symptom burden emphasises the need for dedicated Long COVID assessment hubs to support patients. Further research should investigate whether pulmonary rehabilitation and dedicated psychological input can improve patients' symptoms.

REFERENCE

1. NHS England and NHS Improvement (2021). Long COVID: the NHS plan for 2021/22.

Abstract P139 Table 1 Percentage of patients reporting various symptoms of Long COVID

Symptom	Percentage of patients
Fatigue	98%
Worsening breathlessness	97%
Cognitive symptoms	91%
Myalgia	66%
Chest pain	47%
Ongoing cough	46%
Anosmia	45%

P140 DOES THE LENGTH OF SYMPTOMS OF LONG COVID AFFECT PERCEIVED DYSPNOEA?

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Introduction and Objective Long COVID or ongoing symptoms post-acute COVID infection can affect up to 20% of patients.[1] Dyspnoea can be a cardinal symptom and have a significant impact on patients' quality of life and ability to function in society. NHS England devised a five-point plan for long COVID which included dedicated post COVID assessment clinics.[2]

We aimed to review whether duration of symptoms influenced the severity of perceived dyspnoea (using Borg score) and breathlessness (using MRC dyspnoea score).

Methods Retrospective analysis of patients assessed in the Cheshire and Merseyside long COVID assessment hub between 1 February and 30 April 2021. Data was split into three categories based on duration of symptoms: 3–6 months, 6–12 months and over 12 months. The data was analysed using an ANOVA and tukey's multiple comparison test.

Results 332 patients were assessed, 7 were excluded from analysis.

Of the 325:

- 251 (75.7%) were female
- Age range 17–82 years, mean 47years
- 31 (9.5%) patients received hospital treatment during initial illness
- 305 (94%) patients reported exertional dyspnoea

Abstract P140 Table 1 Results comparing mean Borg/MRC scores against length of time post covid infection

Time assessed in clinic from acute infection (months)	Mean Borg scale (±SD)	Mean MRC score (±SD)
3–6	5.2 (2.0)	2.6 (0.8)
6–12	4.7 (1.9)	2.5 (0.9)
>12	3.3 (2.2)	2.2 (0.9)

Conclusion A significant difference was seen between Borg score in 3–6months and >12 ($P<0.01$), suggesting that perceived dyspnoea due to long COVID improves with time. No significant difference was found in MRC dyspnoea score between each group. The reason for this remains unclear though improvement in perceived dyspnoea with time may offer reassurance to many long Covid patients. Further research is needed to determine if pulmonary rehabilitation provides a greater reduction in perceived dyspnoea.

REFERENCES

1. Ons.gov.uk. 2021. *The prevalence of long COVID symptoms and COVID-19 complications - Office for National Statistics*. [online] Available at: <https://www.ons.gov.uk/news/statementsandletters/theprevalenceoflongcovidsymptomsandcovid19complications> [Accessed 22 June 2021]
2. England N, 2021. *NHS England » NHS to offer 'long covid' sufferers help at specialist centres*. [online] England.nhs.uk. Available at: <https://www.england.nhs.uk/2020/10/nhs-to-offer-long-covid-help/> [Accessed 24 June 2021].

P141 OBSERVATIONAL COHORT STUDY OF PATIENTS REFERRED BY THEIR GP TO A COVID RESPIRATORY CLINIC

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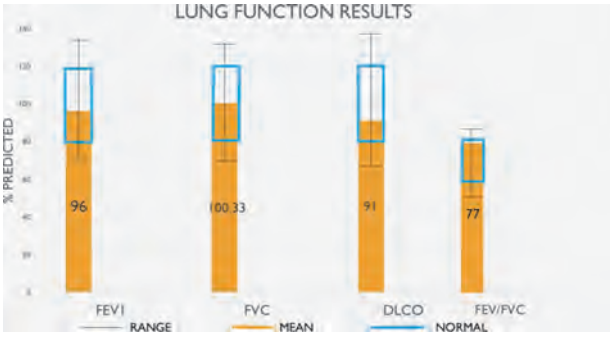
Introduction and Objectives The COVID-19 pandemic resulted in many patients suffering chronic post viral symptoms being referred by their GP to our respiratory Covid clinic. This study describes the demographics, symptoms, radiology, and lung function results for these patients to date. This will provide evidence-based data to improve services and promote recovery.

Method Patients completed the C19 Yorkshire COVID Rehab screening tool and we designed a proforma for clinical assessment. Investigations were performed using a clinical pathway we designed in accordance with national guidelines, and standards of care (NHS England, 2021). Symptoms scores, investigation results, management plans and rates of referral to other specialties were collated.

Results Sixty-six (71%) patients were female and seventy-five (80%) were of white British ethnicity, with a mean age of fifty-one years. The most frequent pre-existing health complaint was anxiety and depression (27%) followed by asthma (17%). 83% suffered greater levels of fatigue post COVID and 80% reported increasing exertional breathlessness. 73% recorded difficulties with concentration and short-term memory. 80% reported problems carrying out usual daily activities. Fifteen (17.5%) had an abnormal chest x-ray (7 resolving COVID, 5 cardiomegaly with normal lungs, 1 pleural plaques, 1 COPD 1 unknown). Sixty-six lung function tests were requested with twenty-six of the thirty-one (84%) performed to date being normal. Four had mild airflow obstruction (including one with COPD).

Conclusion Overall, we concluded that most patients had normal chest radiographs and lung function tests. Long Covid causes a heavy symptom burden significantly affecting the individual's quality of life with chronic breathlessness and fatigue being the most common symptoms. Females, of white British origin with a mean age of fifty-one were most frequently referred to our clinic.

The results prompted us to build a suitable management plan for these patients and we questioned why predominantly white British women were referred, as data has indicated Covid 19 disproportionately affected ethnic minority groups. (Razai et al, 2021)



Abstract P141 Figure 1 Lung function results

REFERENCES

1. NHS England 2021, *National Guidance for post COVID syndrome assessment clinics*, viewed 21/6/20201, available at < https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2020/11/C1248-national-guidance-post-covid-syndrome-assessment-clinics-v2.pdf>
2. Razai MS, Kankam HKN, Majeed A, Esmail A, Williams DR. Mitigating ethnic disparities in covid 19 and beyond. *The Bmj* 2021;372:m4921.

P142 CHAOTIC BREATHING IN POST COVID-19 BREATHLESSNESS: A KEY FEATURE CHARACTERISED BY APPROXIMATE ENTROPY

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10.1136/thorax-2021-BTSabstracts.251

Abstract P142 Table 1 Baseline characteristics and exercise measurements

	Post COVID-19 BPD (N = 20)	Non-COVID BPD (N = 20)	Healthy controls (N = 15)
BASELINE CHARACTERISTICS			
Age/years	41 (10)	49 (14)	50 (18)
Gender M:F	6:14	6:14	9:6
BMI (kg/m^2)	25 (4)	26 (5)	25 (4)
Nijmegen score (/64)	23 (12–44)	23 (14–41)	-
FEV1 (% pred)	111 (13)	107 (16)	96 (6)
FVC (% pred)	118 (14)	114 (16)	107 (12)
FEV1/FVC Ratio	80 (6)	78 (6)	75 (12)
Resting SpO2 (%)	98 (95–100)	99 (94–100)	97 (96–99)
Resting HCO3 − (earlobe) (mmol/L)	24 (5)	22 (3)	24 (2)
Resting PaCO2 (kPa)	4.4 (0.8)	4.3 (0.7)	4.7 (0.5)
Resting BORG CR-10 dyspnoea (/10)	0.7 (0.8)	1.4 (1.3)	0.2 (0.6)
PEAK exercise CPET Variables			
Duration of test (minutes)	10 (4)	9 (2)	15 (3)
Main reason cited for exercise cessation	Legs = 6 Breathing = 14	Legs = 8 Breathing = 12	Legs = 6 Breathing = 4
BORG CR-10 dyspnoea (/10)	End=5.3 (2.3)	End=4.2 (1.5)	End=4.1 (1.7)
Peak VO2 (L/min)	2.18 (0.87)	1.52 (0.62)	2.77 (1.22)
Peak VO2 (% predicted)	106.5 (33.1)	79.8 (17.5)	124.8 (27.3)
Peak VO2 (mL/min/kg)	29.6 (7.6)	20.7 (7.1)	37.8 (14.8)
Peak Heart Rate (beats/min)	170 (12.6)	141 (26)	167 (15)
Heart Rate Reserve (beats/min)	20 (19)	30 (20)	2 (13)
Peak VE (L/min)	89 (26)	60 (27)	96 (35)
Peak Tidal Volume (L)	2.6 (1.3)	1.86 (0.88)	2.37 (0.71)
Peak Breathing Frequency (/min)	43 (23)	31 (9)	33 (8)
Peak SpO2 (%)	97 (93–100)	99 (94–100)	95 (73–98)
PEAK exercise gas exchange values			
PaO2 (kPa)	13.3 (3.2)	13.8 (1.2)	13.7 (1.2)
PaCO2 (kPa)	4.4 (1.1)	4.2 (0.7)	4.1 (0.7)
PETCO2 (kPa)	4.4 (0.6)	4.3 (0.5)	4.8 (0.8)
P(A-a)O2 difference (kPa)	2.8 (1.2)	2.1 (0.9)	2.6 (0.9)
P(a-ET)CO2 difference (kPa)	- 0.10 (0.25)	−0.09 (0.37)	−0.35 (0.53)
Approximate entropy (ApEn) of ventilatory variables during incremental exercise			
ApEn Tidal Volume	1.61 (0.05)	1.28 (0.23)	1.02 (0.29)
ApEn Breathing Frequency	1.40 (0.10)	1.41 (0.20)	1.32 (0.21)
ApEn Minute Ventilation	1.22 (0.11)	0.97 (0.30)	0.65 (0.23)

Data shown as mean (SD) or median (range); M:F: Male:Female; BMI: body mass index; FEV1: forced expiratory volume in the first second; FVC: forced vital capacity; SpO2; oxygen saturation; CPET: cardiopulmonary exercise test; VO2: oxygen consumption; VE:

Background Exertional dyspnoea is a pervasive clinical feature for many patients following COVID-19 infection, with a high prevalence of breathing pattern disorder (BPD) reported. In this study we aimed to characterise exercise ventilatory patterns in patients with exertional dyspnoea following COVID-19 infection, using a non-linear statistical approach.

Method Patients who underwent cardiopulmonary exercise testing (CPET) for unexplained exertional breathlessness following COVID-19 infection, confirmed on PCR or antibody testing, were audited, between May 20 and May 21. Those with evidence of persistent parenchymal changes, thromboembolic disease, or cardiac dysfunction were excluded. Ventilatory irregularity during exercise quantified by approximate entropy (ApEn) was assessed and compared to a historical cohort of controls with non-COVID19 related BPD and health individuals.

Results Over the study period, 20 patients (mean age 41 years (SD 10), 14 (70%) female) fulfilled inclusion criteria and underwent CPET at a median of 4 months (range 3–10) following infection. Chest and cardiac imaging was normal in all patients who had follow-up investigations. Spirometric indices were also normal and the mean (SD) DLCO and KCO were 83% (11.7) and 94% (9.5) predicted, respectively. On exercise testing, most COVID-19 patients stopped secondary to dyspnoea, with a BORG median at 5 (i.e. 'severe') but had a normal VO_2 peak (107% predicted) and gas exchange response, with low indices of VQ mismatching (table 1). ApEN was elevated for tidal volume and VE but similar to non-COVID BPD.

Conclusions Post COVID BPD can be characterised by application of non-linear statistical modelling of exercise ventilatory data. This approach now needs further validation to facilitate application in automated CPET equipment, to identify and highlight this important differential diagnosis.

P143 'IT GIVES YOU THAT HOPE, KNOWING THAT YOU ARE NOT ALONE' – THE JOURNEY OF COVID-19 RECOVERY AND THE REHABILITATION BOAT

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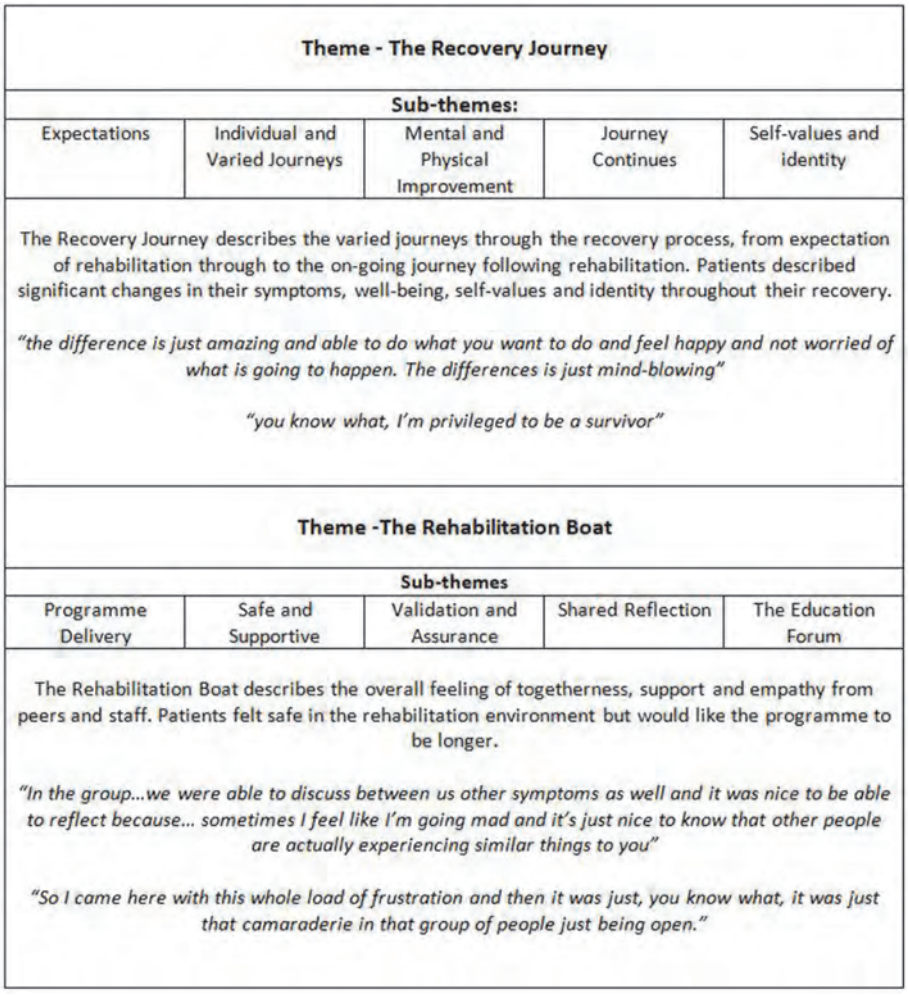
10.1136/thorax-2021-BTSabstracts.252

Introduction The persistent symptoms of COVID-19 are well documented.[1] There is encouraging early data for improvements in fatigue, exercise capacity and cognition in those attending a supervised rehabilitation programme.[2] There is no published data on its perceived acceptability. This study aims to understand patients' lived experience of recovery from this novel disease including experiences of attending a COVID-19 rehabilitation programme.

Methods Patients who attended COVID-19 rehabilitation were invited to take part in virtual focus groups or 1:1 interviews conducted by independent researchers. Inductive thematic analysis was used. A reflective log provided a transparent account of data collection and analysis. Transcripts were coded by the first author and one other researcher, themes were generated and agreed.



Abstract P143 Figure 1 The over-arching themes, sub-themes and illustrative quotes

Findings 13 patients were interviewed (n=9 in two focus groups, n=4 1:1 interviews) (54% male, 62% white British). Themes, sub-themes and illustrative quotes are provided in figure 1. The two over-arching themes were: The Recovery Journey and The Rehabilitation Boat. Patients experienced varied journeys through recovery, but described a feeling of togetherness and support in the rehabilitation environment.

Overall, the severity of acute and post-COVID-19 symptoms were unexpected. For some, symptoms were misunderstood or misbelieved. Expectations for rehabilitation were varied. The opportunity to reflect on shared experiences was valuable and facilitated by offering education sessions as an open forum which was perceived as an important part of the programme. There was a sense of being a survivor and gratitude for support in recovery. Patients described a shift in values to prioritising a healthy lifestyle.

Conclusions Attending rehabilitation for COVID-19 was considered acceptable and important part of recovery and a positive experience. The opportunity to share the experience with others in the same boat was highly valued in the context of an unexpected and potentially lonely COVID-19 recovery.

REFERENCES

1. PHOSP-COVID Collaborative Group, Evans R, McAuley H. Physical, cognitive and mental health impacts of COVID-19 following hospitilisation - a multi-centre prospective cohort study. *MedRxiv*. 2021.
2. Daynes E, Gerlis C, Chaplin E, Gardiner N, S Singh. Early experiences of rehabilitations for patients post-COVID to improve fatigue, breathlessness, exercise capacity and cognition. *CRD*. 2021.

Assessing, managing and predicting outcomes in ILD

P144 RED CELL DISTRIBUTION WIDTH (RDW) AND NEUTROPHIL LYMPHOCYTE RATIO (NLR) AS PROGNOSTIC MARKERS IN IDIOPATHIC PULMONARY FIBROSIS (IPF)

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10.1136/thorax-2021-BTSabstracts.253

Introduction and Objectives Idiopathic Pulmonary Fibrosis (IPF) has a median survival of ~ 2–3 years, but there is significant variability and hence difficulty in advising patients at a personal level. The full blood count (FBC) is readily accessible and gives a Red Cell Distribution Width (RDW), which

describes the percentage variation in red cell size. The neutrophil and lymphocyte count can be used to calculate a ratio (NLR). Limited published work has evaluated the prognostic significance of these markers in IPF. Our aim was to assess longitudinal changes in RDW and NLR as potential prognosticators in IPF.

Methods Patients with IPF were identified from the Royal Devon and Exeter Hospital (2005–2019). Data collected: baseline characteristics, survival, PFTs and FBC <6 months from diagnosis and 6–18 months during follow-up. Patients with insufficient data were excluded. Blood parameters were stratified into quartiles for subsequent Kaplan-Meier survival analyses, Mann-Whitney U-test and Spearman's rank correlation.

Results 131 patients were included in analysis. Median change/month for NLR (deltaNLR) and RDW (deltaRDW) were 0.17 and 0.02 respectively, indicating minimal longitudinal variation. Anti-fibrotic treatment did not modify deltaRDW or deltaNLR. However, stratifying by median deltaRDW significantly impacted on survival (median 33 months with deltaRDW>0.02 vs 59 months; P = 0.04). Median survival stratified on baseline RDW was 35 months (highest quartile) vs 47 months (1st-3rd quartiles) although this did not reach significance (P =0.1439). Median survival based on follow-up RDW was 25 months (highest quartile) vs 59 months (1st-3rd quartiles; P=0.0021) and this was negatively correlated with FVC (P=0.0056). Both baseline and follow-up NLR had significantly shorter median survival in the highest quartile (28 months; p<0.05) compared with 47 months (baseline 1st-3rd quartile) or 59 months (follow-up 1st-3rd quartile). FVC was negatively correlated to baseline NLR (P=0.0282).

Conclusions RDW and NLR demonstrated significant relationships with survival and correlations with FVC. Increasing RDW resulted in poorer outcomes. Although limited by the small retrospective cohort, this data indicates that readily available FBC may have utility in prognostication and progression monitoring in IPF, independent of antifibrotic treatment. RDW may be confounded by co-morbidities; further work to assess this is warranted.

P145 MARGINAL SHORT TERM LUNG FUNCTION CHANGES PREDICT MORTALITY IN PATIENTS WITH FIBROTIC HYPERSENSITIVITY PNEUMONITIS

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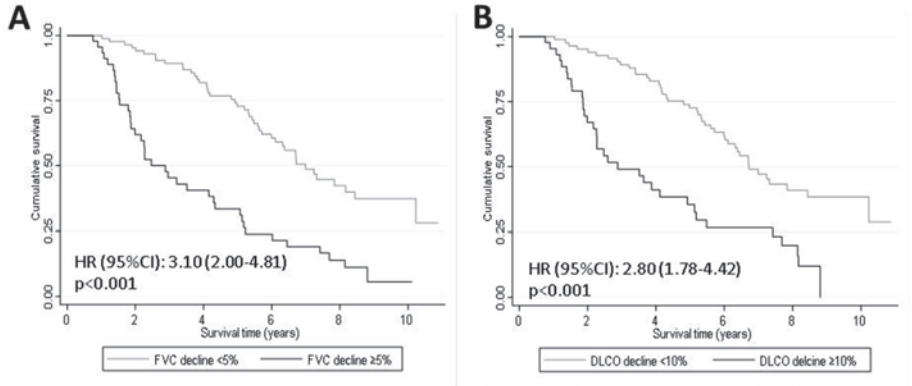
10.1136/thorax-2021-BTSabstracts.254

Background and Objective A proportion of patients with fibrotic hypersensitivity pneumonitis (fHP) follow a progressive disease course despite immunosuppressive treatment. Little is known about predictors of mortality in fHP. We aimed to investigate the impact of marginal, short-term lung function changes in fHP on mortality.

Methods Baseline demographics were recorded for 145 consecutive patients with a Multi-Disciplinary Team diagnosis of fHP, as well as baseline and one year follow-up lung function, baseline echocardiographic findings, bronchoalveolar lavage (BAL) cellularity, and all-cause mortality. Marginal changes in FVC ≥5% and DLCO ≥10% at one year were calculated. Cox proportional hazards analysis was performed to test for associations with mortality.

Results Baseline lung function severity (FVC, DLCO, and composite physiological index (CPI)), age, and PASP ≥40mm Hg on echocardiogram were associated with early mortality, while BAL lymphocytosis was associated with improved survival. A marginal decline at one year in FVC ≥5% (HR: 3.10, 95% CI: 2.00–4.81, p<0.001) and DLCO ≥10% (HR: 2.80 (95% CI: 1.78–4.42), p<0.001) were associated with markedly



Kaplan-Meier survival analysis grouped by decline at one year in (A) FVC ≥5% and (B) DLCO ≥10.

Abstract P145 Figure 1 Survival according to decline in lung function at one year

reduced survival on univariable analysis. Both of these associations remained significant on multivariable analysis correcting for demographic variables, disease severity (as each of: CPI, FVC, and DLCO), and treatment. The association of both measures of decline with early mortality were also maintained when, in separate models, PASP ≥40mm Hg on echocardiography, and BAL lymphocytosis thresholds of 20%, 30% and 40%, were included in addition to demographic variables, disease severity, and treatment.

Conclusions A marginal worsening in FVC of ≥5% and in DLCO of ≥10% at one year are predictive of markedly reduced survival in fHP.

P146 PREDICTORS OF ADVERSE OUTCOME IN SARCOIDOSIS COMPLICATED BY PULMONARY ASPERGILLOSIS

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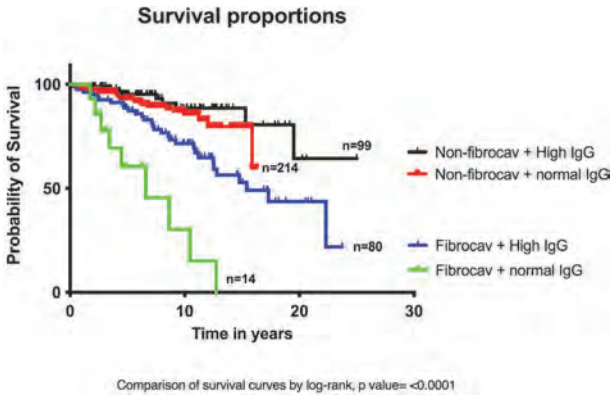
10.1136/thorax-2021-BTSabstracts.255

Introduction Aspergillosis complicating pulmonary sarcoidosis is associated with high mortality. The specific prognostic impact of fibrocavitary sarcoid disease, however, remains poorly understood. A better understanding of the factors that determine adverse outcomes in such patients may improve the management of both the underlying sarcoid disease and associated secondary fungal infection.

Methods Cases of pulmonary sarcoidosis with elevated *Aspergillus* IgG (>40 mgA/L) presenting between January 2009 and March 2021 were retrospectively identified. Controls (sarcoidosis with normal *Aspergillus* IgG titre) were case-matched by baseline%-predicted gas transfer factor (TLco; ±5% variance). Computed tomography (CT), baseline lung function and survival data were analysed.

Results Among 180 cases (high *Asp* IgG) and 229 controls (normal *Asp* IgG), no inter-group difference was evident in the median age at presentation [48 (IQR 40–58) vs 50 (IQR 42–59)] or gender (proportion female: 45.5% vs 51.1%). Amongst the cases, 81/180 (45%) had fibrocavitary changes, compared with 14/229 (6.1%) of the controls (P<0.001). Radiologically-evident aspergilloma was present in 79% (64/81) of the cases with fibrocavitary sarcoidosis. These cases also had poorer lung function compared to non-fibrocavitary disease: mean%-predicted forced vital capacity/FVC 71.3% vs 91.4% (P<0.0001), and in the controls: 69.9% vs 89.1% (P<0.01). A similar trend was observed in%-predicted TLco amongst the fibrocavitary cases: 45.8% vs 64.2% non-fibrocavitary (P<0.0001) and in the fibrocavitary controls: 39.7% vs 61.8% non-fibrocavitary (P<0.0001). Comparing only those with fibrocavitation, neither the%-predicted FVC (71.3% vs 69.9% predicted; P=0.82) nor%-predicted TLco (45.7% and 39.7% predicted; P=0.17) differed between cases and controls. Evidence of fibrocavitary destruction was associated with higher overall mortality (37% vs 9.1% in the non-fibrocavitary subgroup; <0.0001) and longest median survival (graph).



Abstract P145 Figure 1 Survival proportions

Conclusions Fibrocavitary sarcoidosis is associated with worse lung function and poorer median survival. In this group, elevated *Aspergillus* IgG highlights a greater incidence of aspergilloma.

Implications Fibrotic transformation of pulmonary sarcoidosis heightens symptom burden, predisposes to chronic *Aspergillus* infection and is prognostically important particularly when there is supervening fibrocavitary lung destruction. Sensitive stratification of such patients for long-term outcome may help identify particular individuals for earlier and more focused therapeutic intervention.

P147 LONG-TERM PULMONARY FUNCTION AND MORTALITY OUTCOMES IN IDIOPATHIC PULMONARY FIBROSIS PATIENTS TREATED WITH ANTIFIBROTICS

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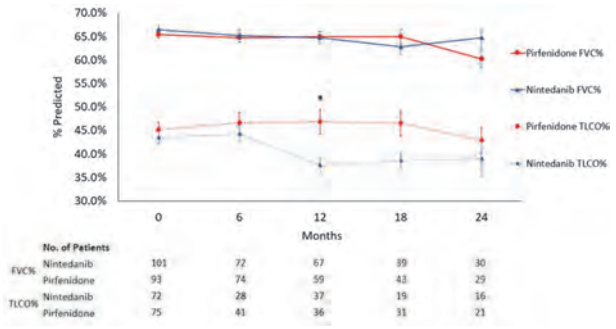
10.1136/thorax-2021-BTSabstracts.256

Background Idiopathic Pulmonary Fibrosis (IPF) is a progressive scarring lung disease. The antifibrotics pirfenidone and nintedanib are approved for IPF patients with a forced vital capacity% predicted (FVC%) between 50–80%, and either drug may be prescribed in the first instance. Both drugs reduce mortality risk, and disease progression as assessed by FVC% and transfer factor for carbon monoxide% predicted (TL_{CO}%) over 12-months. The effectiveness of antifibrotics beyond 12-months is less established, furthermore there is limited real world data comparing pulmonary function and mortality between both drugs.

Aims To assess the effectiveness of antifibrotics on FVC% and TL_{CO}% over 24-months. To identify if the current clinical rationale of offering either antifibrotic from the outset is appropriate through investigating FVC%, TL_{CO}% and mortality outcomes in IPF patients receiving pirfenidone or nintedanib.

Methods We carried out a retrospective analysis of IPF patients with an FVC% between 50–80% who commenced antifibrotic treatment between May 2012 and October 2019 at Royal Papworth Hospital (Cambridge, UK). Separate random coefficient regression models were used to assess FVC% and TL_{CO}% at 0, 6, 12, 18 and 24-months. A Cox proportional hazards model was used to assess hazard ratio (HR) and 95% confidence interval (CI) for all-cause mortality in antifibrotic treated patients.

Results 194 patients were identified from our dataset. FVC % remained stable between 0 and 12-months (p=0.330) but declined between 12 and 24-months (p<0.001). TL_{CO}% decreased between 0 and 12-months (p=0.003) and between 12 and 24-months (p<0.001). Over 24-months, FVC% was



Abstract P147 Figure 1 Mean FVC% (Block lines) and $TL_{CO\%}$ (Dotted lines) over 24-months in patients treated with pirfenidone (Circle) and nintedanib (Triangle). * Significant difference between nintedanib and pirfenidone

similar between pirfenidone and nintedanib (Figure 1) (p=0.495), while TL_{CO}% was greater in pirfenidone treated patients (figure 1), albeit non-significant (p=0.054). No all-cause mortality difference was observed for nintedanib versus pirfenidone (HR = 0.80 [95% CI = 0.46–1.40]; p=0.434).

Conclusions Data from our centre revealed a greater FVC% decline during the 2nd year of treatment compared to the 1st year of treatment. There appears to be no difference in pulmonary function parameters and all-cause mortality between pirfenidone and nintedanib. This supports the current clinical rationale that if there are no contraindications to either drug, patients should be offered the choice of antifibrotic at the outset.

P148 THE COMORBIDOME OF SARCOIDOSIS

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10.1136/thorax-2021-BTSabstracts.257

Introduction and Objectives The concepts of comorbidity and polypharmacy are emerging as important factors in the evaluation, risk stratification, and treatment of patients. As in other diseases, typical of middle-aged and elderly individuals, patients with Sarcoidosis are often affected by one or more comorbidities. The BTS registry currently records TB, current malignancy, Diabetes, Hypertension and Ischaemic Heart Disease as comorbidities in sarcoidosis. We aimed to explore a large cohort to assess prescription trends, identify comorbidity and possible treatment phenotypes.

Methods We identified 151 patients with a tissue confirmed diagnosis of sarcoidosis attending a dedicated clinic and reviewed their electronic care record for filled prescriptions within 3 months. Medications prescribed were used to identify polypharmacy as well as a surrogate marker for co-morbidity (due to coding inefficiencies). Medications were grouped according to indication including treatment need, cardiovascular, metabolic, gastroenterological, musculoskeletal, and psychological disease. We calculated the prevalence of co-morbidities and modelled associations.

Results The 151 patients identified in the cohort included 84 males and 67 females, with an average age of 56. 1065 medications were prescribed, with an average of 7.05 tablets per patient. 44% of patients are on sarcoidosis treatment with 67% of these managed on single therapy, 28% on double therapy and 4% on triple therapy. 4% of patients are prescribed Imraldi. Interestingly, the average number of tablets prescribed increases in the treatment group to 8.8, despite age and gender not being significantly altered. When the medications were grouped the most common prescription groups included gastrointestinal protection, analgesia and bone protection. In keeping with recognised co-morbidities 50% of patients are on primary or secondary cardiac preventative therapy. Comparing patients on treatment with the general cohort there is an increase in the number of patients prescribed analgesia (56% compared with 44%) and antidepressants and antipsychotics (34% compared with 29%).

Conclusion The pattern and impact of comorbidities give significant insights to treatment phenotypes of sarcoid patients attending clinic and inform treatment choices. This granular approach lends itself to Precision Medicine allowing the customization of healthcare being tailored to a subgroup of patients, instead of a one drug fits all approach.

P149 INCIDENCE AND PREVALENCE OF LEFT-SIDED HEART FAILURE IN PATIENTS WITH IDIOPATHIC PULMONARY FIBROSIS: A POPULATION-BASED STUDY

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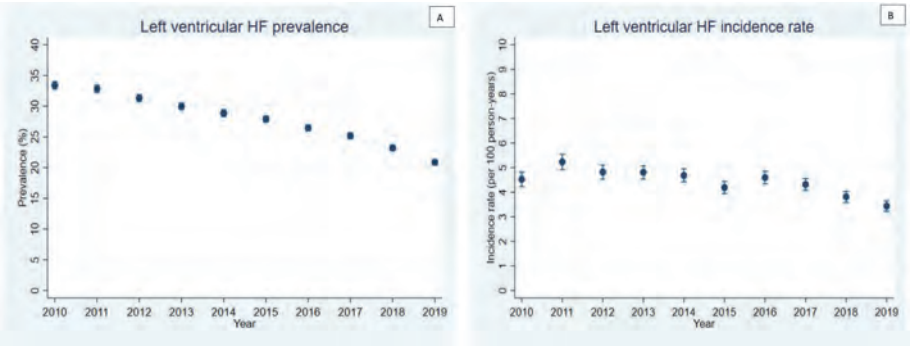
10.1136/thorax-2021-BTSabstracts.258

Background In absence of large epidemiological studies, it is unknown how common left-sided heart failure (HF) is in patients with idiopathic pulmonary fibrosis (IPF), and whether incidence and prevalence has changed over time.

Methods Patients aged >40 years with IPF were included from the Clinical Practice Research Datalink Aurum database of nationally-representative, de-identified primary-care electronic healthcare records covering 18% of the UK population. HF prevalence and incidence were calculated yearly over 10 years (1 January 2010–31 December 2019), stratified by age and sex.

Results 25, 341 IPF patients were included. Median age was 76.4 years (IQR 68.7–82.5). Between 2010–2019, prevalence of HF decreased from 33.4% (95% CI 32.2–34.6) in 2010 to 20.9% (20.0–21.7) in 2019. At all time-points, prevalence was higher in men than women, and with increasing age (in 2019: 8.2% (6.2–10.7) in those aged 40–59; 16.2% (15.1–17.3) in those aged 60–79; and 28.8% (27.3–30.2) in those aged >80). HF incidence rate per 100 person-years (95% CI) remained stable between 2010–2017 but decreased from 4.3 (3.9–4.8) in 2017 to 3.4 (3.0–3.9) in 2019. This trend was noted in both sexes and different age groups.

Conclusion While prevalence of HF in IPF is consistent with previously published estimates and similar to COPD cohorts, incidence rate is 3.9 times higher in IPF than COPD patients at comparable timepoints.[1] While decreasing HF incidence is seen in both IPF patients and the general population, decreasing prevalence in the former contrasts stable prevalence in the latter.[2] Decreasing HF incidence in IPF patients could reflect improved management of cardiovascular risk factors, while decreasing prevalence may be secondary to high mortality. Further studies should help explore factors driving the trends observed and aetiology of HF in IPF.



Abstract P149 Figure 1 Annual prevalence (%) (A) and annual incidence rate per 100 person-years (B) of left ventricular heart failure (HF) in patients with IPF between 2010–2019. Vertical bars for each estimate represent 95% confidence intervals.

REFERENCES

1. Axson EL, *et al*. *Ann Am Thorac Soc* 2020;**17**(8):939–948.
2. Zarrinkoub R, *et al*. *Eur J Heart Failure* 2013;**15**(9):995–1002.

P150 SUITABILITY OF NON-IPF ILD PATIENTS FOR ANTI-FIBROTIC THERAPY – A RETROSPECTIVE COHORT STUDY

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10.1136/thorax-2021-BTSabstracts.259

Introduction This retrospective cohort study was conducted within a district general hospital in Scotland by a 4th year medical student and a supervising consultant respiratory physician.

Aim The primary aim of the study was to determine the number of patients with chronic fibrosing non-IPF ILDs. who could benefit from anti-fibrotic therapy by making comparisons with INBUILD and SENSCIS trials.

Background Currently, NICE recommends the use of anti-fibrotic agents (Pirfenidone & Nintedanib) only in IPF. However, the recent INBUILD and SENSCIS trials showed benefits of using Nintedanib in non-IPF ILDs, a separate study showed similar results with Pirfenidone.

Method An anonymised database of ILD patients was analysed and IPF patients were excluded. The following criteria for disease progression was used, based on the screening model for INBUILD trial:

1. A relative decline of 10% or more in% predicted FVC
2. A relative decline of 5–10% in% predicted FVC ± worsening of symptoms or fibrotic changes
3. Worsening of symptoms and fibrotic changes

Results 92 patients included in the study, 36 (39%) met the criteria for disease progression as outlined above. NSIP and HSP were the most common diagnosis (27 & 19 respectively).

Discussion The mean FVC decline was lower than the 187.8ml in the INBUILD trial, possibly because UIP (an aggressive phenotype) was prevalent in INBUILD patients. The highest decline noted was 15%-25% in patients <65 years old, which is linked with a higher risk of death according to a follow up study, with implications on quality of life and financial burden on the NHS.

Conclusion 39% of the studied non-IPF ILD patients could potentially benefit from anti-fibrotic therapy, with slower disease progression and improved quality of life.

Recommendations Consider the use of anti-fibrotic drugs in non-IPF ILDs, specially where the relative FVC decline is rapid and above 10%.

Abstract P150 Table 1

Total Patients	123
Patients included	92
Gender	
Male (n)	59
Mean age (years)	69.7
Females (n)	33
Mean age (years)	66.9
Deaths	22
Patients with disease progression	36
Relative FVC decline ≥ 10%	10
Mean FVC decline (ml)	57.16

REFERENCES

1. Flaherty KR, Wells AU, Cottin V. Nintedanib in patients with chronic fibrosing interstitial lung diseases with progressive phenotype: the INBUILD trial. *European Respiratory Journal*. 2019 November;**54**(63):1881.
2. Maher TM, Corte TJ, Fischer A. Pirfenidone in patients with unclassifiable progressive fibrosing interstitial lung disease. *The Lancet Respiratory Medicine*. 2020 Feb;8(2):147–157.

P151 ASSESSMENT OF ALVEOLAR-CAPILLARY MEMBRANE PERMEABILITY USING AEROSOL SCINTIGRAPHY IN DIFFUSE CUTANEOUS SYSTEMIC SCLEROSIS – A CROSS SECTIONAL STUDY

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10.1136/thorax-2021-BTSabstracts.260

Background To date, the major diagnostic modalities for ILD in patients with diffuse systemic sclerosis (dcSSc) are limited

to PFTs and HRCT thorax which plays a role after anatomical changes appear in the interstitium. The basic underlying pathology being inflammation in the alveolar epithelium, aerosol scintigraphy assesses the rate of clearance at this level, thereby helping with early diagnosis.

Aims

1. To assess the alveolar capillary permeability in dcSSc patients using Tc 99m DTPA aerosol scintigraphy.
2. To identify the association of DTPA clearance rates with spirometry, HRCT, six-minute walk distance (6MWD), modified rodnan skin score (mRSS), nail fold capillaroscopy (NFC), serum KL–6, SP-D, CA 15–3 and Saint George's Respiratory Questionnaire (SGRQ).

Methodology A cross-sectional study was done between December 2018 and December 2020 at a tertiary care hospital in South India after institutional ethics committee clearance. Cases of dcSSc satisfying the ACR/EULAR 2013 criteria were recruited into the study after obtaining consent. They underwent aerosol scintigraphy, HRCT thorax, spirometry, mRSS, NFC, 6MWT, SGRQ and serum testing for KL-6, SP-D and CA 15–3.

Results Of the total participants (n=58), the mean DTPA clearance rate (T½) was found to be 49.6±25.7 minutes. ROC analysis determined 59.5 minutes as the cut off for detecting the presence of ILD (sensitivity 81.2%, specificity 66.7% compared to HRCT). The combination of T½, KL-6 and CA 15–3 had a higher sensitivity (89.6%) and specificity (76.9%) in detecting ILD early. Clearance T½ correlated positively with Warrick CT score, 6MWD and negatively with FVC, mRSS and serum CA 15–3.

Abstract P151 Table 1 Diagnostic value of DTPA clearance half-life, serum biomarkers and their combination in SSc-ILD

DTPA clearance half time	
Mean DTPA clearance rate (T½) (mins)	48.11±23.99
AUC (95% CI)	0.646 (0.455 – 0.837)
Cut off value (mins)	49.625
Sensitivity (%)	68.6
Specificity (%)	60
Serum biomarker	
Serum KL-6, ng/ml [median (IQR) (range)]	0.19 (0.534) (0.029 - 4.123)
Serum SP-D, ng/ml [median (IQR) (range)]	2.24 (39.125) (0.1 - 683.728)
Serum CA 15–3, U/ml [median (IQR) (range)]	187.87(226.12) (16.22–757.67)
Serum KL-6	
AUC (95% CI)	0.798 (0.686 – 0.910)
Cut off value, ng/ml	0.1875
Sensitivity, %	62.5
Specificity, %	92.3
Serum SP-D	
AUC (95% CI)	0.76 (0.631 – 0.898)
Cut off value, ng/ml	155.61
Sensitivity, %	66.7
Specificity, %	76.92
Serum CA 15–3	
AUC (95% CI)	0.764 (0.633 – 0.896)
Cut off value, U/ml	122.61
Sensitivity, %	79.2
Specificity, %	61.5
ROC model	
T½, serum KL-6 and CA 15–3	
AUC (95% CI)	0.899
Sensitivity, %	89.6
Specificity, %	76.9
P value	0.00
Likelihood ratio	3.88

P152 PNEUMOCYSTIS JIROVECI PNEUMONIA PROPHYLAXIS IN PATIENTS TREATED WITH MYCOPHENOLATE MOFETIL FOR INTERSTITIAL LUNG DISEASE

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10.1136/thorax-2021-BTSabstracts.261

Background Incidence of *Pneumocystis jirovecii* Pneumonia (PJP) among immunosuppressed individuals who are HIV-negative is rising in the UK.[1] There is a lack of evidence for whether patients with interstitial lung disease (ILD) treated with mycophenolate mofetil (MMF) benefit from PJP prophylaxis. This may increase variability in clinical practice between centres or clinicians. If PJP prophylaxis isn't supported by the evidence, this may represent unnecessary use of antibiotics.

Aims To identify whether ILD patients treated with MMF were less likely to develop PJP or require antibiotics for lower respiratory tract infection (LRTI) while on PJP prophylaxis.

Methods We performed a retrospective audit of patients at The Newcastle upon Tyne Hospitals NHS Foundation Trust who were treated with MMF for ILD. We recorded the proportion of patients given prophylaxis, the agents used, and the incidence of PJP and LRTI requiring antibiotics (including GP records) in this cohort.

Results Data was collected on 105 patients who were currently prescribed MMF or had been in the past 5 years. 75/105 (71.4%) were female and the median age was 68 years old. Median treatment length with MMF was 21 months. The majority of patients were diagnosed with chronic hypersensitivity pneumonitis (57.1%) or connective tissue disease-related ILD (16.2%). 36/105 (34.3%) were prescribed prophylaxis with co-trimoxazole, azithromycin or dapsone throughout the period studied, while 6/105 (5.7%) were prescribed prophylaxis for some but not all of the time that MMF was prescribed.

No patients in the cohort developed PJP while prescribed MMF regardless of prophylaxis use. Significantly more patients (18/42 [42.9%]) received antibiotics for LRTI while prescribed PJP prophylaxis compared to those not concurrently prescribed prophylaxis (14/69 [20.3%], $p = 0.011$, χ^2 test).

Conclusion Results from this cohort suggest that PJP infection in patients prescribed MMF for ILD is relatively uncommon regardless of prophylaxis use. There may be an increase in the incidence of LRTIs with PJP prophylaxis, although further study is required to determine this and the value of PJP prophylaxis in this patient group.

REFERENCE

1. Maini R, *et al*. Increasing pneumocystis pneumonia, England, UK, 2000–2010. *Emerging Infectious Diseases*, 2013;**19**(3):386–392.

New treatment pathways in the post-COVID-19 era

P153 A PATIENT CENTERED PATHWAY TO SUPPORT OPTIMAL SYSTEMIC STEROID DOSE REDUCTION AFTER STARTING BIOLOGIC THERAPY IN ASTHMA

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10.1136/thorax-2021-BTSabstracts.262

Introduction Historically maintenance oral corticosteroids (mOCS) provided the only effective treatment option for many patients with severe asthma but at the cost of severe side-effects including diabetes, weight gain and osteoporosis. Biologic therapies targeting type-2 inflammation have been shown to significantly reduce the need for mOCS in severe asthma. However, a significant proportion of patients fail to reduce their steroid dose and remain on mOCS despite the introduction of a biologic therapy highlighting the unmet need for improved OCS stewardship in this population.

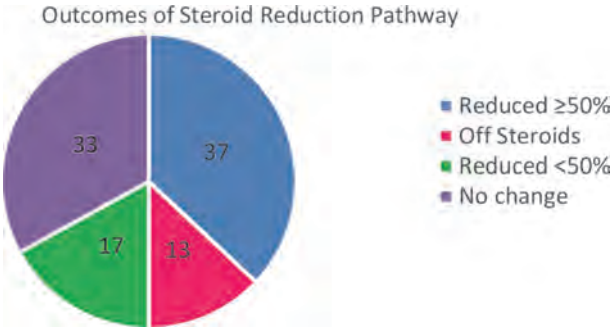
A nurse-led supportive steroid weaning pathway was established to support patients through their steroid reduction journey.

Method Adults with severe asthma on a biologic therapy, alongside mOCS, who had previously been unable to reduce their steroid dose were offered enhanced support including education, a personalised structured OCS weaning plan, safety monitoring (for adrenal insufficiency) and 4-weekly reviews (face-to-face or virtual) alongside telephone support with the asthma nurses. A steroid weaning leaflet, designed by the team, was provided to all patients and included information on adrenal insufficiency, sick day rules and preparing for a cortisol test.

Results 24 patients were enrolled between January-April 2021. 12 (50%) patients managed a $\geq$50% reduction in their steroid dose of which 3 patients were weaned completely off mOCS. 4 patients (17%) managed a dose reduction of <50%. 8 (33%) patients remained on their starting dose due to adrenal insufficiency.

Patient feedback has been positive, particularly relating to the additional education (including the steroid weaning leaflet) and the enhanced support (with 4-weekly reviews) provided through this service.

Conclusion It is important to recognise and address patient's understandable anxieties regarding steroid weaning and to support them during this process. The implementation of a patient-centred steroid weaning pathway enabled a significant steroid dose reduction in 67% of severe asthma patients on biologic therapies who had previously unsuccessfully attempted OCS weaning. This reflects a group of patients who would otherwise have had their biologic therapy discontinued on the grounds of sub-optimal efficacy and would have continued to suffer the severe side-effects of mOCS treatment justifying the additional resources required to support this service



Abstract P153 Figure 1

P154 A PATHWAY TRANSFORMATION TO TRANSITION FROM A 'ROUTINE' TO A 'RESPONSIVE' SEVERE ASTHMA SERVICE IN THE POST COVID ERA

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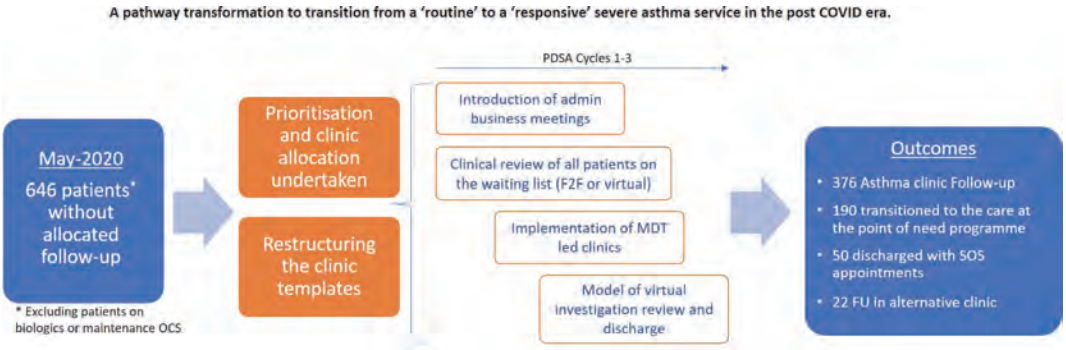
10.1136/thorax-2021-BTSabstracts.263

Background Historical care delivery models in severe asthma have resulted in an extensive burden of long-term follow-up within services leading to significant waiting lists for 'routine' appointments. This was exacerbated by the COVID-19 pandemic creating an urgent need to address rising waiting lists and implement novel care pathways maximising remote support for patients whilst ensuring prompt access to the team at a time of clinical need and the continued delivery of safe and effective patient-centred care.

Methods A comprehensive review of the clinic footprint identified 646 patients with difficult or severe asthma awaiting 'routine' follow-up (outside of a treatment pathway). A manual risk stratification tool was developed in collaboration with our patient representatives and MDT, with patients triaged into multi-disciplinary clinic streams through a collaborative clinical and administrative process (ensuring previous waiting times, patient risk and need for MDT interventions/treatments were considered). All reviews were undertaken remotely with face to face appointments only where clinical benefits outweighed the risk. A PDSA process was used to concurrently assess the processes for risk stratification, patient discussion and clinic transition.

Results 638 patients were reviewed May-September 2020 with 59% requiring continued follow-up within the asthma service and 30% safely transitioned from routine follow-up to remote supervision with review at the time of need. 8% were discharged with an SOS appointment and 3% were followed up in an alternative respiratory clinic. The process was well received by patients with the majority feeling confident with their follow-up arrangements. Phenotypic details have been recorded to ensure timely review and access to novel therapies where these become available.

Conclusions The COVID-19 pandemic has necessitated a comprehensive re-evaluation of services and care pathways across the NHS. Transitioning from a 'routine' to 'responsive' patient-triggered service has facilitated flexible but personalised care empowering patients in the self-management of their asthma and significantly reducing the burden of 'routine' follow-up for patients and the MDT. This has reduced waiting times and increased capacity for new patient assessments whilst ensuring patients are offered timely reviews when their asthma control deteriorates, delivering equitable access across the system with the potential to improve patient outcomes.



Abstract P154 Figure 1 A pathway transformation to transition from a 'routine' to a 'responsive' severe asthma service in the post COVID era

P155 DELIVERING PHYSIOTHERAPY OUTPATIENT ASSESSMENT AND TREATMENT IN A SEVERE ASTHMA CLINIC IN THE ERA OF COVID-19

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10.1136/thorax-2021-BTSabstracts.264

Introduction and Objectives The global SARS-CoV-2 pandemic has forced clinicians to consider alternative methods of service provision to patients with respiratory conditions who were clinically vulnerable and/or advised to shield.

Breathing pattern disorders (BPD) are a common comorbidity affecting approximately one third of patients with asthma. The respiratory physiotherapy team within the Portsmouth Severe Asthma Service (PSAS) recognised the need to continue to assess and deliver treatment for patients with BPD particularly at a time of heightened anxiety.

Breathing retraining requires precise and highly specific assessment and treatment to ensure optimal outcomes and the decision to use a video conferencing platform was made to utilise the visual medium. To ensure quality service was being delivered, patients using the video conferencing platform to receive respiratory physiotherapy in the PSAS were asked for feedback.

Methods At the end of every video consultation, written feedback was requested. Sixty-nine responses were received from July 2020-May 2021. Patients were asked to rate their physiotherapy consultation from very good to very poor; how they would prefer to receive treatment; if they would use this method of consultation again and the ease of use of the video consultation.

Results Of the 69 responses:

- 68/69 (98%) would use the service again
- 58/69 (84%) rated the service as very good
- 35/69 (51%) would choose video over face to face appointments
- 23/69 (33%) would prefer to be seen face to face
- 63/69 (91%) felt that accessibility of the video platform could be improved

Qualitative feedback was also gathered from patients and included statements such

- Excellent quality and a very thorough appointment.
- It was helpful to actually see a clinician face to face via video instead of a phone call

Conclusions Video consultations have proven to be a feasible and successful way of assessing BPD in asthma patients. Despite feedback regarding the ease of accessing the online platform being suboptimal, overarching positive responses to video consultations was received. With 51% favouring being seen via video consultation rather than face to face, this has wider implications for patients and the NHS including reduced travel time to appointments and reduced waiting room pressures.

P156 A REGIONAL STUDY OF THE AVAILABILITY, UPTAKE AND BARRIERS TO INHALER RECYCLING: PROMOTING ENVIRONMENTAL SUSTAINABILITY

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10.1136/thorax-2021-BTSabstracts.265

Introduction and Objectives Change is needed to reach the NHS environmental target to reduce inhaler carbon emissions by 50% over the next decade. We focused on inhaler sustainability, exploring available recycling schemes and community uptake. 73.000.000 inhalers are used annually in the UK and 63% form part of domestic waste. Our objective was to identify available recycling schemes nationally and regionally and explore factors influencing availability. Subsequently, to promote recycling schemes and increase local uptake.

Methods We performed an online search for available recycling schemes in the UK. Furthermore, we identified 21 pharmacies in Liverpool and surveyed them between March and May 2021. We aimed to determine how many inhalers they dispensed and whether they offered safe disposal and recycling. If they recycled, we explored what scheme they used and how they promoted it. If not, we explored why and what would encourage them to participate.

Results Following the end of the GSK 'completing the cycle' scheme in September 2020, there is one available scheme (TEVA One) nationally that has now paused enrolment. We received questionnaire responses from 14 of 21 pharmacies approached. On average, they dispensed 97.7 inhalers monthly. 64% (9/14) accepted inhalers for safe disposal and 28% (4/14) reported accepting inhalers for recycling. However, on further investigation, this was for safe disposal only. Only 9.8% of inhalers dispensed were returned for safe

disposal. Sustainability and monetary incentives were the main reported driving factors for recycling engagement, and all pharmacies would consider subscribing to a recycling scheme if available.

Conclusions Despite interest from local pharmacies, there are no available inhaler recycling services in the area we examined, and safe disposal uptake is very low. Promotion, patient education and investment are required for the NHS to meet its sustainability targets.

P157 EFFECTIVENESS OF A MULTI-DISCIPLINARY COMMUNITY RESPIRATORY TEAM DURING THE COVID-19 PANDEMIC

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10.1136/thorax-2021-BTSabstracts.266

Introduction The Community Respiratory Response Team (CRRT) was established to manage patients within Greater Glasgow & Clyde NHS Trust (NHS GGC) with chronic lung disease at home during the COVID-19 pandemic. We analysed the effectiveness of a triage pathway for appropriately targeting care, and overall effectiveness of the service in reducing the outcomes of Emergency department (ED) attendance, hospital admission and death.

Methods Electronic health records of patients referred in May 2020 were retrospectively reviewed. The relationship between CRRT triage pathway and emergency department (ED) attendance, hospital admission and death within 28 days of referral was assessed, with respect to primary respiratory condition.

Results Mean patient age was 69 years (median 71; IQR 62–79). 66% of patients were female. Figure 1 shows CRRT patient triage and outcomes. Excepting the blue 'end of life care' triage pathway, higher triage category was associated with higher rates of ED attendance, hospital admission and death. The only death in the green triage group was due to a non-respiratory cause. Patients triaged red or amber were more likely to receive more than one consultation. In particular, patients with COPD in red and amber triage groups were more likely to have multiple CRRT consultations or a home visit.

87% of consultations were conducted remotely; mean 4.4 consultations/patient; 35% received a home visit. No nosocomial COVID-19 infections occurred. 52% of deaths occurred in patients with COPD or asthma/COPD overlap. Increasing number of consultations was associated with reduced mortality but not reduced ED attendance or hospital admissions. However, for patients diagnosed with COPD and triaged as highest risk, having over 3 consultations was associated with lower ED attendance (16% vs 30%) and admission rates (18% vs 26%). Hospital admissions and inpatient deaths for COPD patients in the 2nd quarter of 2020 were 47% and 65% of previous years, respectively.

Conclusions The NHS GGC CRRT was able to safely and appropriately risk stratify patients and complement tertiary care by providing support at home with potential impact on reducing hospital admissions and deaths. Wider implementation of multidisciplinary community respiratory care could benefit patients and the healthcare service.

P158 THORACIC ULTRASOUND ON THE RESPIRATORY POST-TAKE WARD ROUND: ASSESSING THE IMPACT ON CLINICAL DECISION-MAKING AND THE PATIENT JOURNEY

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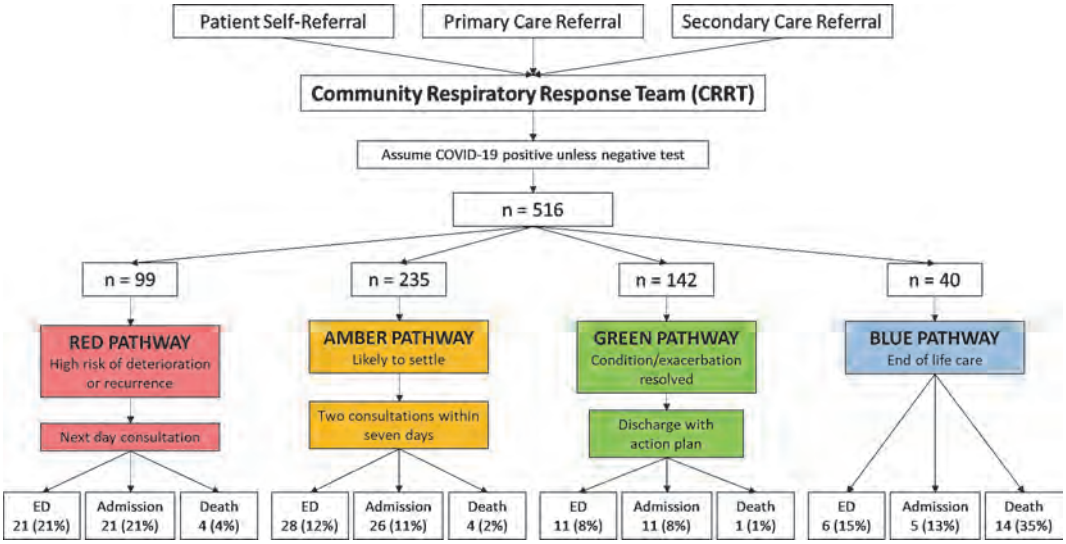
10.1136/thorax-2021-BTSabstracts.267

Introduction Thoracic ultrasound (TUS) has become indispensable when assessing the acutely unwell respiratory patient. We examined the impact of TUS on clinical decision-making and patient management, inviting discussion regarding the routine use of TUS on the respiratory post-take ward round (PTWR).

Methods Data was collected prospectively from fifty consecutive patients allocated to the acute respiratory PTWR. TUS



Abstract P157 Figure 1

was performed and standardised utilising the validated 'BLUE protocol', performed by the same operator. Domains included demographics, respiratory comorbidities, diagnoses, and management plans prior to, and following TUS.

Results Of fifty patients scanned, TUS altered overall management in 22 (44%). Primary diagnosis was changed in 26%, treatments in 34%, investigations in 28%, and all three aspects in 18%. TUS performed well in fluid balance decisions and identifying lung consolidation.

Patient groups where TUS would not alter management were identified, with reduced odds seen with pre-existing airways disease (odds ratio (OR) 0.37, 95% confidence interval (CI) 0.12–1.17), and in patients with airways disease and wheeze on auscultation (OR 0.08, 95%, CI 0.01–0.77).

Chest x-ray (CXR) reports differed from TUS findings in 12 (24%). 21 (42%) patients later underwent computed tomography (CT) examination with CT reports corresponding with positive TUS findings in 100%, with no further emendation of diagnoses (excluding incidental findings). Data was not collected to assess the time implications of performing ultrasound on the consultation, and we acknowledge that not all Respiratory physicians are ultrasound trained thus limiting the provision of thoracic ultrasound.

Discussion The use of TUS impacted significantly on decision-making on the Respiratory PTWR. Unnecessary radiology requests, ionising radiation, and cost were avoided. Within the constraints of the study group, TUS seems less useful when assessing patients with pre-existing airways disease. TUS has excellent correlation with CT findings, outperforms CXR, appearing to offer a comprehensive, streamlined respiratory assessment at the 'front-door'.

With ultrasound becoming more accessible to clinicians, and with increasing demands on CT departments, we welcome discussion regarding regular use of TUS on the PTWR. Further data would be desirable to assess whether its use early in admission is correlated with a reduced length of stay and improved patient outcomes.

P159 OUTCOME FROM INVASIVE VENTILATION FOR PATIENTS WITH LEARNING DISABILITY

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10.1136/thorax-2021-BTSabstracts.268

The annual learning disability mortality review (LeDeR)[1] highlights that patients with learning disability (LD) are twice as likely to die of avoidable causes, with inappropriate ceilings of treatment being instigated in patients with LD: 23% of 'Do Not Attempt Cardiopulmonary Resuscitation' forms documented inappropriate medical conditions such as a learning disability as the sole reason to not attempt resuscitation[1]. The COVID19 pandemic has further highlighted this issue, with people with LD being at 6 times the risk of death from COVID19 than those without LD; people with LD aged 18–34 were 30 times more likely to die of COVID19.[2] However, there is little data out there to help support decision making around invasive ventilation in people with LD.

We aimed to explore the outcomes of patients with LD admitted to a single critical care unit for invasive ventilation

Methods We reviewed the notes of patients with learning disability requiring intubation and ventilation over a 5-year period (2016–2020). Data was retrospectively collected on survival, rates of tracheostomy insertion and requirement for long term ventilation (LTV) or cough augmentation.

Results 15 patients were identified with LD who required invasive ventilation. 93% survived critical care admission. 7% required tracheostomy with subsequent decannulation, whilst a further 7% required long term tracheostomy. 40% were commenced on LTV. 46% required long term cough augmentation via cough assist device. 46% have subsequently died, with a mean survival following critical care admission of 2.5 years. Mean duration from invasive ventilation in the survivor group is 5.5 years.

Conclusion We have demonstrated good outcomes in patients with LD admitted to critical care for invasive ventilation. Although there was a high requirement for LTV and cough augmentation following admission to critical care for invasive ventilation, we have demonstrated both good survival to discharge from critical care and good long term survival in this group. This small single centre study highlights the need for further research to aid decision making around escalation decisions in patients with LD.

REFERENCES

1. The learning disability mortality review (LeDeR): Annual report. 2020.
2. COVID19 deaths of people identified as having learning disabilities: summary. Public Health England. 2020.

P160 COMMUNITY RESPIRATORY STAFF IN-REACH INTO CARE HOMES FINDS UNMET NEED AND ALLOWS OPTIMIZATION OF PATIENT CARE PLUS CARE HOME STAFF EDUCATION

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10.1136/thorax-2021-BTSabstracts.269

Introduction During the Covid epidemic the care of patients in care homes to optimize their therapy and prevent admission has become a national Priority. In the Basildon and Brentwood CCG area staff normally working in the community respiratory service were redeployed to visit all the care homes in the area and review all patients with respiratory disease to optimize therapy, advise flu immunisation and support their care.

Methods All care homes in the area of Basildon, Brentwood , Billericay and Wickford were visited and a review carried out on all patients resident there with respiratory disease. This included reviewing both notes and patients to find patients with respiratory disease. Therapy was reviewed and optimised, including obtaining new inhalers, spacer devices and rescue packs.

Results 163 patients were reviewed, of whom 116 had evidence of respiratory disease. 31 of these were already known to the community respiratory services and 85 were not known. 75% of patients needed a new salbutamol inhaler or aero-chamber spacer device. 58% of patients did not have a rescue pack of antibiotics and steroids and this was provided. 85% of those not already known to the service required salbutamol,. A spacer and a rescue pack.

These were all provided.

Conclusions In this area there was a large unmet need for treatment in patients in care homes with respiratory disease as one of their diagnoses. This project untaken during the covid epidemic has demonstrated that it was possible to provide this in a covid-secure manner and found a need for education of care home staff and a need for a wider application of this project which is now being rolled out to the other CCG (Thurrock) in our area. Educational materials are being produced and distributed to all care homes in the area. The in-reach of community respiratory team staff into care homes can be used as an avenue to ensure good education of care home staff and increase vaccination of staff and residents and optimization of therapy for residents to reduce the risk of hospital admission

P161 UNDERSTANDING THE ROLE OF A PATIENT-LED PULMONARY FIBROSIS CHARITY ON ENABLING SUPPORT GROUPS TO THRIVE: A UK WIDE SURVEY OF SUPPORT GROUP LEADERS AND MEMBERS EXPERIENCES

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10.1136/thorax-2021-BTSabstracts.270

Introduction Pulmonary fibrosis is a devastating progressive lung scarring disease with poor prognosis. Evidence suggests that peer support, facilitated through disease-specific support groups, has a positive impact on patients and their carers. Charities can play a crucial role in setting up and sustaining such groups. We sought to understand the role of tailored support, provided by a patient-led pulmonary fibrosis charity, on support group leaders (SGLs) and their members.

Methods The charity offers tailored support to 75 independent support groups through grants, guidance and training which aims to empower, increase confidence and ensure quality.

Two surveys were conducted via a 10 minute web-based questionnaire. SGLs completed a 20-item survey and members completed a 12-item survey, requiring 4-point Likert scale and open-ended responses. All SGLs were invited to participate and to share the member survey with their group.

Results 22 SGLs and 81 members participated. 91% SGLs felt they had the necessary knowledge and skills to support their members but identified training needs in supporting people through loss and change (82%), and ways to keep positive and motivated (82%). 55% did not think they received ongoing referrals to their group and 86% felt that grants or initiatives to recruit new members or reach isolated patients were important.

Members felt the support group had helped them to feel part of a supportive community (94%); and more informed about pulmonary fibrosis (94%) and manage daily symptoms more effectively (90%).

Conclusions The survey results replicate previous findings that support groups have tangible benefits for patients and carers. Provided with tailored charity support, SGLs feel equipped to support their members, most of whom report a positive impact from being part of a group. Noting the difficulty gaining new members, new initiatives will be needed, working closely with healthcare professionals, to ensure patients can access this important support service.

Topics in thoracic malignancies

P162 PREPARING WALES FOR LUNG CANCER SCREENING – SELECTING A SEARCH STRATEGY FOR INCLUSION

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10.1136/thorax-2021-BTSabstracts.271

Introduction Lung Health Check (LHC) programmes have used varying invitation strategies, from contacting all patients in the target age range (Manchester), identifying ever-smokers from GP records (NHS England Targeted LHC programme), and inviting people recorded on GP records as a current smoker in the last 20 years (SUMMIT). We modelled the impact different inclusion criteria would have on a future Lung Health Check programme in Wales.

Methods GP records from 6 practices were included. Searches were run varying the age range (50–74 years, 55–74, 60–74) and smoking codes included. Four different search strategies for smoking codes were used: BROAD (including a wide range of current and ex-smoker codes), VOLUME (as for 'BROAD' but excluding the 'trivial ex-smoker' code), FOCUSSED (looking for cigarette-related tobacco codes only), and RECENT (searching for current smoker codes recorded in the last 20 years, to capture current smokers and more recent ex-smokers). We compared the results of these search strategies and extrapolated to the Welsh population.

Results The included practices had a total population of 68,571, reflecting 2.17% of the Welsh population. There was negligible difference between the results for the BROAD, VOLUME and FOCUSSED search strategies, with ≤0.1% variation between the strategies. Just over half of patients would be eligible for a LHC using the BROAD strategy, whilst using the RECENT strategy reduced this to around a third. Full results and extrapolation across the Welsh population are shown in table 1.

Conclusions The selection criteria for a future LHC programme in Wales would profoundly influence the number of

Abstract P162 Table 1 Results of search strategies and extrapolation to Welsh population

Age (yrs)			*BROAD search strategy*		*RECENT search strategy*	
All ages						
Sample	68,571	Sample=2.2% of				
Wales	3,152,879	Wales population				
50-74						
Sample	20,406	29.8% of total	10,733	52.6% of	6,887	33.7% of
Wales	938,263	population	493,501	age group	316,663	age group
55-74						
Sample	15,766	23.0% of total	8,426	53.4% of	5,200	33.0% of
Wales	724,917	population	387,426	age group	239,095	age group
60-74						
Sample	11,031	16.1% of total	6,075	55.1% of	3,504	31.8% of
Wales	507,203	population	279,327	age group	161,113	age group

people eligible. Across Wales the eligible population could vary from 493,000 using an age range of 50–74 years and a broad search strategy, down to 161,000 using an age range of 60–74 years and limiting the search strategy to current and more recent ex-smokers. As radiology reporting capacity may be the limiting factor for a national programme, focussing invitations to those at highest risk may be desirable in the early stages of project development.

P163 PREPARING WALES FOR LUNG CANCER SCREENING – UPDATING GP RECORD SMOKING DATA USING AN AUTOMATED TEXT MESSAGE SYSTEM

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Introduction Targeted lung cancer screening requires identification of current and ex-smokers. In the NHS England Targeted Lung Health Check Programme this relies on smoking history data in GP records. There are concerns about the completeness and accuracy of this data, meaning some eligible people may not be invited. We interrogated GP records at several practices in Wales to examine the completeness of smoking data and used an automated text message system to update smoking data for people with no smoking status recorded.
Methods GP records for patients aged 50 to 74 years (+ 364 days) were searched for the collective tobacco '137' Read code. Patients with no tobacco-related code were sent a standardised text message with the option of three replies to indicate their smoking status. On successful reply, a tobacco Read code was automatically recorded in the patient record, and a confirmation text including a link to 'Help Me Quit' was sent to the patient.
Results Across six GP practices, 670/20,402 patients (3.3%) aged 50–74 had no tobacco code recorded. Of these, 293 (43.7%) had a validated mobile phone number recorded, of whom 166/293 (56.7%) successfully replied to the text. Of these, 71/166 (42.8%) were current or ex-smokers, including 21 (12.7%) current smokers.
Conclusions An automated text message system was used to successfully update smoking data in patients with no smoking status recorded. Of the respondents, almost half proved to be current or ex-smokers who would be eligible for a Targeted Lung Health Check. This system could be used to improve the completeness of GP records smoking data, particularly as a resource-sparing method at practices with lower levels of data completeness.

P164 OUTCOME OF LUNG NODULE SURVEILLANCE: A BRIEF RETROSPECTIVE REVIEW OF A COHORT OF PATIENTS FOLLOWED-UP ACCORDING TO BTS GUIDELINES

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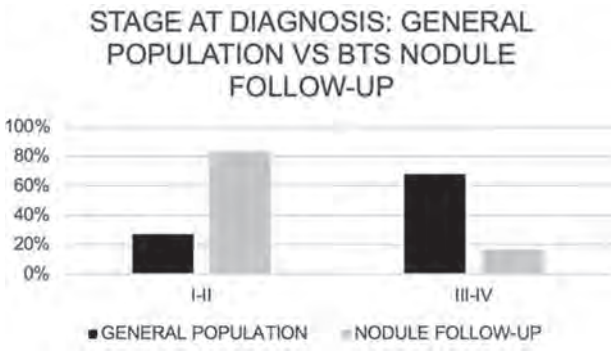
Introduction Lung cancer continues to be the leading cause of cancer death in the UK and the 2nd most common cancer diagnosed each year. In 2015, the British Thoracic Society (BTS) published the updated guidelines on lung nodule follow-up with the aim of improving early identification of lung malignancies and improving survival. Here we aim to determine the rate of early cancer detection in patients referred to the lung nodule MDT and explore their outcomes.
Methods Patients were identified from the minutes of lung nodule MDTs celebrated during 2018 and information gathered via RIS, PACS and clinical record systems of the hospital.
Results 92 patients were identified using the method described above. The median age of participants was 67.5 (42–88) and there were slightly more females than males (51 to 41; 55.4 to 44.6%). The rate of compliance with guidelines was very high at 98.9%. We identified 6 lung primary malignancies of which all but 1 (83.3%) were in early stages (stage I or II), compared to 27% in lung cancers detected in the population (figure 1). Of the patients with early-stage lung cancer, 3 were judged not fit for active treatment. The other 2 underwent lobectomies and have had more than 2 disease-free years as of the time of this writing.



Abstract P164 Figure 1 Comparison between the stages at diagnosis in patients in surveillance programme(grey) vs those in the general population (black)

Conclusion This data shows that implementation of the BTS guidelines in lung nodule follow-up leads to higher rates of early-stage lung cancer detection and improved prognosis for these patients. However, we also note that a relatively high proportion of these detected lung cancers are found in patients with poor functional status making them ineligible for active treatment. We propose that it may be beneficial for future editions of this BTS guidelines to explore including clear entry and retainment criteria for patients which, no matter the outcome, will be unable to withstand active treatment. These could include looking at, for example, elements such as minimum functional or pulmonary status. This would avoid some patients undergoing a 2 to 4-year-long surveillance programme which will ultimately not affect their management options.

P165 THE 'SUSPICIOUS' CHEST X-RAY. HOW GOOD ARE WE AT DISTINGUISHING HIGH RISK FROM LOW RISK ABNORMALITIES?

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10.1136/thorax-2021-BTSabstracts.274

Introduction We have developed two parallel direct recall CT pathways for patients with abnormal CXRs – a CX3 (NOLCP) pathway where CXR is suspicious for lung cancer,

Abstract P165 Table 1 Summary of final diagnoses for the two direct recall CT pathways – CX2, CXR with low suspicion of cancer but CT correlation required and CX3, CXR with high suspicion of cancer.

	CX2 pathway (CXR low suspicion of cancer)				CX3 pathway (suspicion of cancer)			
CXR abnormality	Lung cancer	Other cancer	Non cancer	% Cancer	Lung cancer	Other cancer	Non cancer	% Cancer
Nodule/mass	2	1	43	6.5	54	5	38	60.8
Other/unspecified peripheral opacity (incl. consolidation)	17	7	252	8.7	9	3	41	22.6
Hilum	2	0	67	2.9	8	2	25	28.6
Effusion/pleural abnormality	6	2	21	27.6	5	4	15	37.5
Collapse/atelectasis	1	0	34	2.9	6	0	1	85.7
Artefact/normal variant	3	1	100	3.8	0	0	0	-
Mediastinum/paratracheal	1	0	18	5.3	0	2	0	100.0
Normal but concerning symptoms	0	0	19	0.0	0	0	1	0.0
Elevated hemidiaphragm	0	0	8	0.0	0	0	0	-
Inappropriate use of pathway (e.g. ILD)	0	0	17	0.0	0	0	0	-
Total	32	11	579	6.9	82	16	121	44.7

and a CX2 (urgent but non 2ww) pathway where suspicion is low but CT confirmation is warranted. Normal and benign abnormalities are categorised as CX1. We looked at the types of CXR findings reported as suspicious vs low suspicion for cancer and the rates of cancer diagnosis within each pathway to assess how well radiologists were able to identify suspicious lesions.

Methods Using electronic records, patients that had a direct recall CT following primary care requested CXR from May 2018 – May 2019 were cross-referenced with our local cancer databases. Cancer diagnosis until May 2020 were recorded, such that all patients had 12–24 months of follow up following CXR. A respiratory lung cancer physician then subdivided CXR reports into broad categories of abnormalities and the incidence of cancer within each group was determined.

Results 622 abnormal CXRs were reported as low suspicion for cancer (CX2) and in this group 43 (6.9%) were diagnosed with cancer. 219 CXRs were reported as suspicious for cancer (CX3) and this was confirmed in 98 (44.7%). Results are summarised in *table 1*. Radiologists were good at distinguishing high risk from low risk abnormalities in the following categories: defined nodule/mass (cancer rate 60.8% vs 6.5%), collapse/atelectasis (85.7% vs 2.9%), hilar (29% vs 3%) and mediastinum (100% vs 5%) but were less able to distinguish between high and low risk pleural abnormalities (37.5% vs 27.6%) and other/unspecified peripheral opacities (22.6% vs 8.7%).

Conclusion We found a small but significant percentage of cancers following CXR abnormalities which did not meet NOLCP thresholds, suggesting there is still a role for direct recall CT outside NOLCP in this group. Our data suggests that radiologists should maintain a lower threshold to direct pleural effusions and other (non nodule) peripheral opacities through the fast track NOLCP pathway, as the ability to distinguish benign from malignant causes appears to be lower than for other types of CXR abnormality.

P166 CONTRAST ENHANCED PET-CT. DEVELOPMENT AND EXPERIENCE OF A NOVEL IMAGING PATHWAY IN SUSPECTED LUNG CANCER

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Background Neuroimaging is recommended for stage II and III lung cancer when radical treatment is being considered. Furthermore, patients with an initial non contrast scan may require a second contrast chest CT to delineate mediastinal structures, e.g. prior to surgery. We have developed a protocol for contrast enhanced PET-CT scan, which enables a PET scan and contrast CT brain and chest to be obtained during a single examination, reducing three separate patient appointments to one. We present outcome data for the first 12 months of the pathway.

Methods Patients are selected for contrast PET-CT if at risk of stage II or III disease on initial CT– i.e., tumour >2cm/central or suspicious N1/2/3 nodes. Contrast PET-CT imaging is undertaken on a Siemens mCT Flow Edge Biograph 128 scanner; CT slice thickness 1.5mm. Initial imaging is taken from base of skull to proximal thigh 60–70 minutes post FDG tracer and 70 seconds post IV contrast. CT Brain imaging is undertaken immediately after completion of PET component of scan (~20 minutes post IV-contrast). Data was collected retrospectively for patients undergoing contrast PET-CT from June 2020 to June 2021.

Results 44 patients have had contrast PET-CT scans via this novel pathway. Scanning protocols were optimised until diagnostic quality images of brain and mediastinum were obtained

Abstract P166 Table 1 Summary of final NSCLC staging/diagnosis for all patients who have undergone contrast enhanced PET-CT

Final staging/diagnosis	Number	%
Stage I	6	13.6
Stage IIA	2	4.5
Stage IIB	2	4.5
Stage IIIA	7	15.9
Stage IIIB	6	13.6
Stage IIIC	1	2.3
Stage IVa	6	13.6
Stage IVb	5	11.4
Carcinoid	2	4.5
Metastatic cancer	4	9.1
Non-malignant diagnosis	3	6.8

in all patients. Final staging is summarised in *table 1*. 4 patients (9.1%) with stage II disease did not require further neuroimaging. One patient (2.3%) was found to have brain metastases, which were confirmed on MRI. 9 of the patients with stage III disease on PET-CT went on to have negative MRI brain imaging as per national guidelines.

Conclusion Contrast PET-CT is feasible and can provide diagnostic quality CT images of brain and mediastinum. This removes the need for a separate contrast CT brain in patients with stage II disease and enables contrast CT mediastinal images to be obtained following a low dose non contrast initial CT, eg lung cancer screening. Further work is required to assess the additional benefit/cost effectiveness of MRI brain where contrast CT-PET demonstrates stage III disease.

P167 EVALUATION OF EBUS SERVICE-DELIVERY ACROSS THE UK: A NATIONWIDE SURVEY

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Introduction and Objectives There has been a significant increase in EBUS services across the UK since the recognition of transbronchial needle aspiration (TBNA) guided by endobronchial ultrasound (EBUS) as a key diagnostic step in the diagnosis and staging of suspected lung cancer.[1]

However, there has been no national study to look at how EBUS services are delivered in the UK. The purpose of this study was to assess any variations in the operational setup and practice of EBUS services across the UK.

Methods We conducted an online survey of EBUS practices in the UK between January and March 2020. A response from the EBUS operators was sought from every U.K. Hospital Trust, looking at potential variables in the delivery of EBUS services. One response per site was accepted.

Abstract P167 Table 1 Results

	Number (percentage) of responses		
Type of EBUS session	Dedicated 31 (26.3)	Combined with bronchoscopy 79 (66.9)	Other 8 (6.8)
Number of operators	Single 27 (22.8)	Two 83 (70.3)	Variable 8 (6.8)
Second operator, when present	Consultant 40 (44)	Trainee or Fellow 48 (52.7)	Practitioner 3 (3.3)
Number of weekly EBUS sessions	Less than two 46 (39)	Two to Four 61(51.7)	Other 11 (9.3)
Number of patient slots per list	Less than two 8 (6.8)	Two to Four 100 (84.7)	More than four 10 (8.5)
Allocated time per case	<45 minutes 5 (4.2)	45–60 minutes 110 (93.2)	>60 minutes 3 (2.5)
Cyto-pathologist present	Yes 12 (10.2)	No 106 (89.8)	
Suspension medium	Normal saline 26 (25.0)	Formalin 37 (35.6)	Formalin and saline 32 (30.8) Others 9 (8.7)
Slides prepared	Yes 18 (15.3)	No 100 (84.7)	

Results 218 responses by senior clinicians were received from 118 centres delivering EBUS service in England, Wales, Scotland, and Northern Ireland. Results are summarised in table 1.

Discussion More than two thirds of the centres deliver EBUS in sessions combined with bronchoscopy, whilst 61% of centres offered at least two weekly sessions; There may be cost-effectiveness in pooling EBUS into dedicated sessions.

In more than 70% of cases, two operators were utilised whilst a single operator performed EBUS in only 23% of centres; More than 50% of the hospitals used a trainee or fellow to assist in the procedure, demonstrating a range of operational practices.

Almost 90% of trusts had no pathologists to guide real-time sampling. The predominant medium used for suspension of cytopathological samples was formalin (35.6%), reducing degradation of cytopathological samples compared to normal saline.

Conclusion This survey demonstrates notable differences in EBUS practice across the UK, which could result in variation in cost-effectiveness, quality, and safety; A national consultation group may allow dissemination of best-practice.

REFERENCE

1. National Institute for Health and Care Excellence. Endobronchial ultrasound-guided transbronchial needle aspiration for mediastinal masses. Interventional procedures guidance, 27 February 2008.

P168 ENDOBRONCHIAL ULTRASOUND-GUIDED TRANSBRONCHIAL NEEDLE ASPIRATION FOR ASYMPTOMATIC OR INCIDENTAL BILATERAL HILAR OR MEDIASTINAL ADENOPATHY: AN UNNECESSARY TEST?

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Introduction and Objectives There is a lack of consensus regarding the need for biopsy in patients presenting with asymptomatic bilateral hilar or mediastinal adenopathy (BHMA). The American Thoracic Society suggests close follow up a 'reasonable alternative' to biopsy. The British Thoracic Society suggests multidisciplinary input in atypical clinical or radiological cases.

Our hypothesis was that in our population endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) provides little diagnostic value over Computerised Tomography (CT) of the Thorax in the investigation of asymptomatic or incidental BHMA.

Method We conducted a retrospective analysis at our NHS Trust, assessing whether EBUS-TBNA revealed occult malignancy or unexpected pathology in patients presenting with asymptomatic or incidental BHMA on CT.

Inclusion criteria included a radiological diagnosis of likely sarcoid with bilateral hilar lymphadenopathy and/or non-specific adenopathy with no other lung parenchymal abnormality. Exclusion criteria included cases of known malignancy or radiological features of malignancy as reported by a radiologist.

Results Between September 2016 to August 2019, a total of 366 EBUS-TBNA procedures were performed, of which 80 cases met the inclusion criteria. Adequate TBNA samples were obtained in 72/80 (90%). 57 cases had features consistent

with sarcoidosis and 13 samples showed benign or reactive features. 1 sample was suspicious for lymphoma on TBNA (this was later excluded by further investigations). 1 patient had EBUS-TBNA showing non-caseating granulomas but was subsequently re-evaluated for thrombocytopaenia and hyperferritinaemia. A lymphoma was later confirmed by extrathoracic lymph node biopsy.

Of the 8 cases where initial EBUS-TBNA samples were inadequate, 5 were deemed benign following multidisciplinary team assessment, subsequent biopsy or surveillance. 3/8 cases underwent a further EBUS-TBNA showing features consistent with sarcoidosis.

Conclusion In our population, EBUS-TBNA in asymptomatic individuals with BHMA rarely results in a diagnosis of malignancy or significant pathology. Careful evaluation combined with CT surveillance may be a suitable alternative to early EBUS/TBNA in this cohort of patients.

REFERENCES

1. Diagnosis and Detection of Sarcoidosis, Crouser, *et al*., American Journal of Respiratory and Critical Care Medicine, Volume 201, Issue 8, 4/15/20
2. BTS Clinical Statement on pulmonary sarcoidosis, Thillai, et al. Thorax 2/12/20

P169 AN UPDATE ON THE STRATIFY (STAGING BY THORACOSCOPY IN POTENTIALLY RADICALLY TREATABLE NON-SMALL CELL LUNG CANCER ASSOCIATED WITH MINIMAL PLEURAL EFFUSION) STUDY

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Introduction Pleural effusion is common in lung cancer. Metastatic disease may be confirmed on imaging or fluid sampling. A minority of patients however with otherwise radically treatable disease have a small effusion not amenable to aspiration, or from which fluid cytology is negative; termed minimal pleural effusion (mini-PE). Previous retrospective studies associate significantly shorter survival in mini-PE than stage-matched cases without mini-PE and hypothesise this reflects occult pleural metastases (OPM) in up to 80% of patients. STRATIFY (Staging by Thoracoscopy in Potentially Radically Treatable Non-Small Cell Lung Cancer (NSCLC) Associated with Minimal Pleural Effusion) is a multicentre, prospective observational study, which will determine the true prevalence of OPM in this setting. An update on the study is provided here.

Methods STRATIFY was funded by Chief Scientist Office and opened to recruitment in Jan-20. Target n=96 across 8 UK centres in 18 months. Key eligibility criteria include Mini-PE (defined by an ipsilateral effusion <1/3 hemithorax on chest radiograph), radically treatable NSCLC and LAT feasibility (defined by sufficient fluid ± lung sliding on screening ultrasound). Primary endpoint: Prevalence of OPM, defined as NSCLC cells in parietal pleural biopsies. Key secondary endpoints include LAT safety, the impact of LAT results on NSCLC treatment plans and non-invasive MRI-derived measures of cardiac function and altered body composition (as alternative explanations for mini-PE). Study progress, including the impact of COVID19 was reviewed and summarised.

Results STRATIFY was rapidly halted due to COVID19 after 1 patient was recruited. The study was allowed to reopen in July-20 but given a dramatic reduction in lung cancer referrals across the UK and delayed site set up processes, the study team took the decision to close recruitment from Oct-20 to Apr-21. This was supported by the funder who provided a costed 6-month extension. By June-21, 4/8 sites have opened. 4/6 six screened patients have been recruited, 2/4 have entered the MRI sub-study.

Conclusions STRATIFY will determine the true prevalence of OPM in patients with radically treatable NSCLC and mini-PE. The study outcomes will be important in defining an extended role for LAT as a pleural staging tool.

P170 PLEURAL RECURRENCE AFTER TRANSTHORACIC NEEDLE LUNG BIOPSY IN STAGE I LUNG CANCER

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Introduction Hong et al determined, from 2394 patients with stage 1 lung cancer, that needle or intra-operative transthoracic biopsy had a higher risk for pleural recurrence.[1] There was local concern that a straight to surgery approach advocated might not be sustainable and/or warranted, that the data might only apply to Asian countries, and that there were missing values for microscopic invasion.

Methods An analysis of all Stage 1 lung cancers enrolled onto the Somerset cancer register was performed (Caldicott ref 3756). Exclusion criteria were mesothelioma, non-lung cancers and non-diagnostic biopsies. Data collected were demographics, diagnostic procedures, operation, pathology, CT findings, time to recurrence, recurrence type, survival and time to death.

Results 493 patients with stage 1 cancer were identified (Jan 2013-Dec 2020). Data was insufficient in 34.169 patients had a positive CT guided or pre-operative biopsy: mean age 73 years (range 48–97) and 105 (60%) females. Diagnoses were predominantly 99 (57%) adenocarcinomas and 49 (28%) squamous cell cancers. Any recurrence occurred in 42 (24% vs 19% with Hong et al[1]) patients and concomitant ipsilateral pleural recurrence in 10 (6%-similar). Of those 10, 8 underwent CT guided biopsies, and 2 pre-operative biopsies, 8 were male, 2 female and 50% (5) were adenocarcinomas. 8 were solid tumours, and 6 had pleural contract. Lympho-vascular-pleural invasion was present in 6 of those 10 patients. Mean time to recurrence was 8.8 months (4–18) and mean time from recurrence to death 8.1 months (1–26). 210 patients had no biopsies, mean age was 77 years (49–99). Any recurrence occurred in 32 (15%); pleural recurrence in 2(1%), mean time 19 months. 2 patients in this

group had treatment (surgery with incomplete excision). Differences between the groups did not reach statistical significance.

Conclusions This single centre retrospective study in a predominantly Caucasian population replicates pleural recurrence rates from Hong et al.[1] This data might inform local processes but large prospective databases are required for national guidance. Significant limitations to this are its retrospective nature, reliance on coding, and length of follow up. Local recurrence is associated with Incomplete surgical resection and possibly the preceding biopsy.

REFERENCE

1. http://dx.doi.org/10.1136/thoraxjnl-2020–216492

P171 SABR: ACCEPTABLE AND EFFICACIOUS: A 7 YEAR EXPERIENCE FROM A NORTH EAST HOSPITAL

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10.1136/thorax-2021-BTSabstracts.280

Introduction Stereotactic Ablative Body Radiation Therapy (SABR) is a treatment for inoperable stage 1 non-small cell lung cancer. Surgery is the gold standard (5-year survival rates ~70%).[1 2] In a review of 4570 patients treated with SABR, overall local control rates were on average 92.7% at 1 year, 89.9% at 2 years, 86.7% at 3 years and 89.6% at 4–5 years with corresponding overall survival rates of 87%, 82.9%, 59.6% and 39.6% with a mean follow-up of 29.4 months.[1] No local review has ever been performed. We sought to add to the literature and inform local practice.

Methods All patients with Stage 1 lung cancer receiving SBAR from the local Somerset cancer register were identified (local Caldicott guidance). on radiology reports Basic demographics and outcomes were collated.

Results 100 patients received SBAR from Jan 2013-Dec 2020. 61 were female, mean age was 76.5 years (range 48–97. Overall recurrence rate was 19% (n=19) [8 local recurrences and 11 metastatic]. Mean time to recurrence was 24.3 months. Due to concerns about biopsies causing recurrence, those with no pre-SBAR biopsy were analysed separately. 72% (72) patients were identified: recurrence rate was 13 (18%)- 4 local and 9 metastatic; mean time to recurrence 26 months. Survival was 90% at 1 year, 89% at 2 years, 65% at 3 years and 40% at 4–5 years. In the biopsy group (n=28), 25 did not have surgery and had SABR. 3 had post-operative SABR. Recurrence rate was 21% (6), mean time to recurrence in this cohort was 20 months, 4 local recurrences, 2 metastatic. Survival at the same above intervals were much lower (15% at 5 years). There was no statistical difference between the groups. Data on immediate toxicity was not available due to SBAR being performed in a regional centre but no adverse events were noted on local scans.

Conclusions This review shows that recurrence rates are comparable to previous evidence and surgical recurrence rates (30–77%).[2] SABR seems safe. There are significant limitations to this data set (retrospective nature, reliance on coding, no matched controls and no comparison to surgery locally).

REFERENCES

1. https://www.sabr.org.uk/wp-content/uploads/2019/04/SABRconsortium-guidelines-2019-v6.1.0.pdf
2. https://erj.ersjournals.com/content/47/2/374

P172 INDWELLING PLEURAL CATHETER REMOVAL AND AUTO-PLEURODESIS: PREDICTORS AND OUTCOME

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Introduction Indwelling pleural catheters (IPC) provide definitive management of malignant pleural effusion. IPCs offer similar control of dyspnoea to talc pleurodesis without hospital admission but require ongoing management. Up to 47% of patients with IPC undergo auto-pleurodesis facilitating removal. Patient factors leading to this are not well understood.

Methods Retrospective analysis of IPC data at a UK tertiary centre between 2019–2021. Procedure reports, radiology, pathology and electronic patient records were reviewed to assess the most frequent diagnoses, imaging, and pleural fluid biochemistry leading to IPC removal. Outcomes and complications were analysed.

Results 115 patients underwent IPC insertion and 55 patients (47.8%) underwent IPC removal over the two year period. The median duration between insertion and removal was 97 days (IQR 62–133).

Indications 71% (39/55) of IPC removals were undertaken due to auto-pleurodesis, with other causes comprising of pain (3.6%; 2/55), blocked catheter (3.6%; 2/55) and non-draining, organised effusions (21.8%; 12/55).

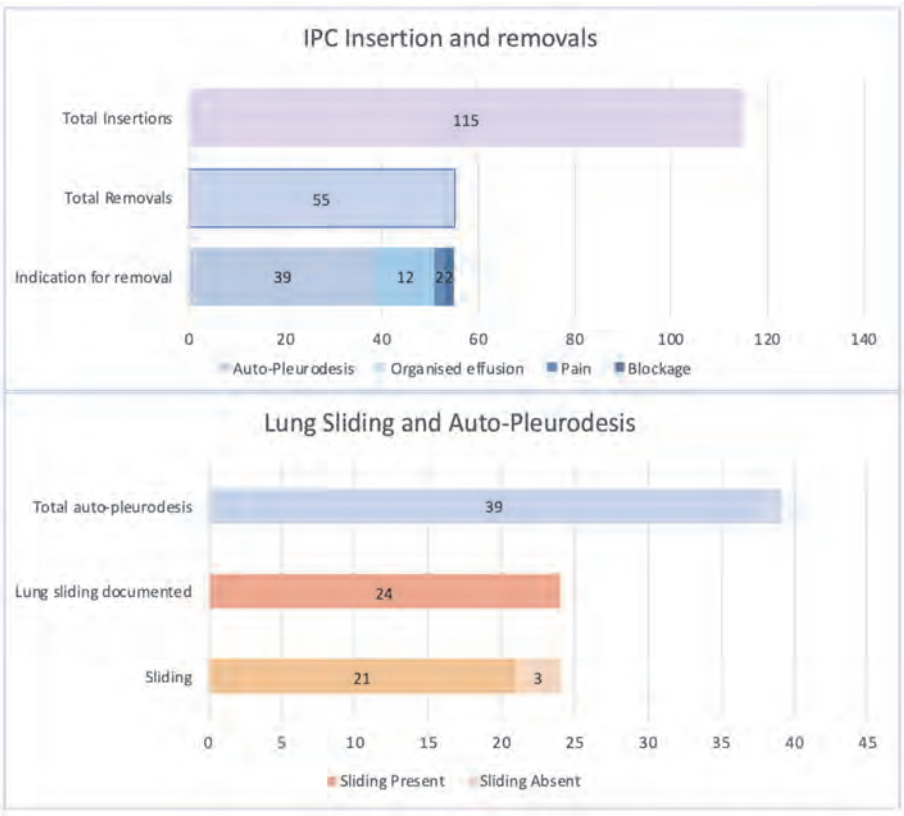
The most common primary malignancies associated with auto-pleurodesis included mesothelioma (31%, n=12), lung (18%, n=7), breast (18%, n=7).

Lung-Sliding on Ultrasound Prior to IPC insertion Of the patients that underwent auto-pleurodesis, 24 had documentation pertaining to lung sliding on ultrasound. Lung sliding was present pre-insertion in 87.5% (21/24) and absent in 12.5% (3/24).

Inflammatory-Biochemistry Median pleural fluid LDH in patients with auto-pleurodesis was not significantly different vs baseline LDH in all patients with MPE (236.5IU/L auto-pleurodesis vs 326IU/L in all MPE, P>0.05, Mann-Witney).

Complications IPC removals resulted in few complications with retained catheter fragment (7.2%; 4/55) being the most reported. No patients required admission for a procedure related complication. Following IPC removal, 4 patients required further pleural aspiration and 3 re-insertion of IPC.

Conclusions A significant proportion of patients with IPC undergo auto-pleurodesis. In this cohort of patients IPC removal presents a low risk of complications and offers significant benefits to patient comfort. The presence of lung sliding on ultrasound prior to insertion appears to be correlated with auto-pleurodesis, and this requires further investigation in larger prospective studies. The ability to give patients more information regarding likelihood of auto-pleurodesis could add to the decision making process for definitive fluid control.



Abstract P172 Figure 1 a) Chart illustrating number of IPC insertions, removals and indications for removal; b) Chart illustrating number of patients with auto-pleurodesis with lung sliding on ultrasound prior to insertion of IPC

Perspectives on education, training and research collaboration

P173 MIND THE GAP! RESEARCH EXPERIENCE OF RESPIRATORY TRAINEES- A NATIONAL SURVEY

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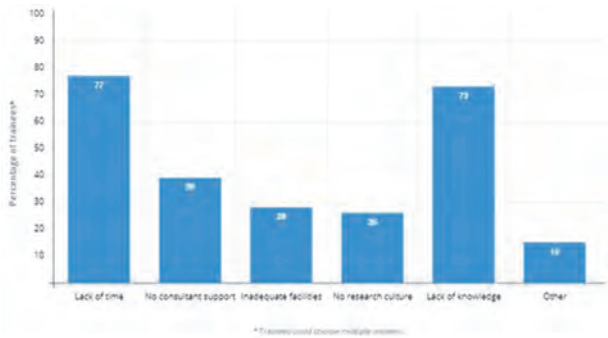
10.1136/thorax-2021-BTSabstracts.282

Introduction Over the last decade there has been a surge in the number of trainee research collaboratives, notably in surgery and anaesthetics. These networks give trainees a new pathway to gain valuable experience of research design and implementation. Trainee collaboratives in medical subspecialties remain a minority, with only three in respiratory. The National Institute for Health research (NIHR) national Respiratory National Specialty Group has a 5-year strategy that includes 'developing researchers of the future' and therefore are keen to promote these collaboratives.

Methods With the support of the NIHR a self-reported cross-sectional survey was conducted to investigate the research experience and views of current respiratory trainees. All current respiratory trainees (n=768) were invited to take part in a short web-based survey via emails cascaded by local Training Programme Directors.

Results 97 (12%) complete responses were received with a good spread from across England and training grades. Unfortunately, no responses were received from the devolved nations. The majority (62%, 60/97) of trainees had not taken time out of training for research and only 38% (23/60) of these trainees had experience of research during their training. However, this number improved during the recent pandemic with 58% (56/96) of trainees supporting COVID-19 trials. Trainees could only access a trainee research network in 3 of the 15 local CRN geographic areas. Of those without, 88% (61/69) were interested in joining one. Perceived barriers to performing research included lack of time and lack of awareness of how to get involved (*see figure 1*). Training needs identified included networking with local mentors and online research training and support.

Conclusion Clinical research can significantly improve patient outcomes and is a core curriculum requirement for trainees.



Abstract P173 Figure 1 Perceived barriers to undertaking research during respiratory training

Unfortunately, our survey shows that most trainees who would like to engage with research have not had access. There is currently a unique opportunity to build upon the recent surge in research interest following widespread engagement in COVID-19 trials. There is a lack of accessible research experience for respiratory trainees. A potential solution would be a national trainee research network which could provide a unique opportunity for the creation of high-quality collaborative research spearheaded by trainees.

P174 RESEARCH FOR ALL: THE IMPACT OF NWCORR, A TRAINEE RESEARCH COLLABORATIVE

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10.1136/thorax-2021-BTSabstracts.283

Introduction and Objectives There is an ongoing need to increase trainees participation in research in order to equip tomorrow's consultants with the skills required to appraise and deliver innovation. Trainee research networks have been established in a range of specialities, resulting in high impact studies benefiting patients whilst involving and developing trainees. However, to date, there are only a few such initiatives in the respiratory community. Here, we describe the experience of a collaborative in the Mersey and North West regions.

Methods Launched in February 2020, the North West Collaborative Organisation for Respiratory Research (NWCORR), has fostered collaboration between respiratory trainees from the Mersey and North West Deaneries to create high quality, multicentre research. This collaborative has been initiated with the support of National Institute of Health Research (NIHR) Clinical Research Network (CRN) Greater Manchester and supported by mentorship from research-active consultants in subspecialties relevant to its projects and Local CRN lead. The network now provides all trainees in clinical training a new pathway to gain valuable experience of research design and delivery through mentorship and networking as valuable part of specialty training.

Results With 42 active members, NWCORR has undertaken three research projects with several projects planned. Over 1300 patients have been included across 13 hospitals, with 39 trainees gaining valuable research experience (*see table 1*). Trainees have led on all aspects of research projects from design to publication. Completed projects have significantly impacted the care of COVID-19 patients whilst engaging 39 trainees across 2 deaneries and have been published and/or presented to disseminate the results.

Conclusions The experience of NWCORR reflects a high rate of trainee enthusiasm to participate in research alongside clinical training and highlights the potential of collaborative networks. It has enabled trainees who may not wish, or have the opportunity, for an 'out of programme' research post to develop research skills and interests. We believe NWCORR and other trainee research collaboratives can, and should, play a pivotal role in embedding a research culture into everyday practice, improve patient care and build early career researchers within the NHS.

P175 BRONCHOSCOPY TRAINING IN SCOTLAND: FEEDBACK FROM RESPIRATORY TRAINEES DURING THE SARS-COV-19 PANDEMIC

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10.1136/thorax-2021-BTSabstracts.284

Aims and Objectives The curriculum for bronchoscopy training in the UK is generic and lacks clear goals for trainees to achieve. In addition to this, assessment methods currently used are informal and vary according to the individual trainee and trainer. In contrast to this, gastroenterology trainees use the same online platform to log their progress nationwide. The online platform allows trainers to review trainees' progress, thus allowing a focused approach to teaching.

Additionally, the SARS-CoV-19 (COVID-19) pandemic has caused a drastic reduction in bronchoscopy lists, thus curtailing training opportunities. Our aim was to gather feedback on Scottish bronchoscopy training during the COVID-19 pandemic and to identify areas needing improvement more generally.

Abstract P174 Table 1 List of studies that NWCORR have undertaken since its inception

Study name	Description	Project start	Project end	No. of trainees involved	No. of hospitals	No. of patients	Presentations	Publications
CURB-COVID-NOW Project	Investigating the use of CURB65 as a prognostic score for COVID-19 patients.	March 2020	December 2020	19 Trainees	9 sites	830 Patients	BTS Winter Meeting Feb 2021	BMJ Open Research DOI: 10.1136/bmjresp-2020-000729 PMID: 33293361 *
CPAP COVID Project	Investigating ward-based oxygen therapy and CPAP in patients with COVID-19 pneumonitis	August 2020	May 2021	18 trainees	7 Sites	479 Patients	North West Thoracic Society March 2021	Manuscript in preparation
Post inflation pneumothorax chest drain management project	Investigating clamping of chest drain post pneumothorax resolution	August 2020	Ongoing	7 trainees	4 sites	Ongoing		

* Bradley P, Frost F, Tharmaratnam K, Wootton DG; NW Collaborative Organisation for Respiratory Research. Utility of established prognostic scores in COVID-19 hospital admissions: multicentre prospective evaluation of CURB-65, NEWS2 and qSOFA. BMJ Open Respir Res. 2020 Dec;7(1):e000729. doi: 10.1136/bmjresp-2020-000729. PMID: 33293361; PMCID: PMC7722817.

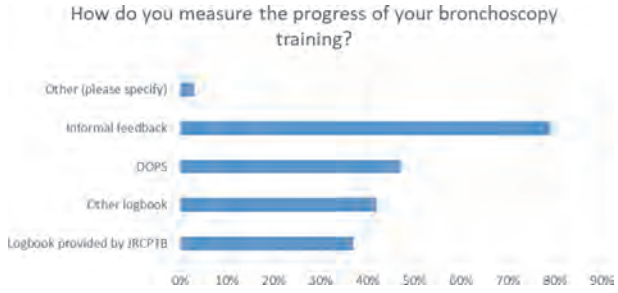
Methods Scottish respiratory trainees were emailed an online questionnaire in February 2021 to gather qualitative and quantitative data on their bronchoscopy training. The ten questions were designed to assess how many procedures trainees have done during the pandemic, how training has been affected, and how training could be improved.

Results 38 respiratory trainees responded from all deaneries in Scotland. Of these, 95% said their training was affected by the pandemic. In addition, 92% did not feel there was a clear curriculum for bronchoscopy training. Only 4 people (11%) had done more than 50 bronchoscopies since the start of the pandemic and 23 people (61%) had done less than 20. The main reasons cited for this were reduced number of lists, reduced number of patients per list and other clinical commitments (figure 1).

Most participants used informal feedback to measure their progress (79%); the JRCPTB logbook was used the least (37%) (figure 2). Every participant thought bronchoscopy training could be improved. Attending more lists, simulation training and improved methods of assessment were the most frequently selected options for improving training (figure 3).

Conclusions Our data has indicated a need for change in bronchoscopy training. In particular we found trainees were dissatisfied with the curriculum and methods of assessment.

Abstract P175 Figure 1



Abstract P175 Figure 2

Abstract P175 Figure 3

From our literature search, UK bronchoscopy training lacks a clear and robust structure compared to other countries. This data will be used to support a proposal for a bronchoscopy simulation training programme.

P176 THE RESTRUCTURING AND DEVELOPMENT OF A RESPIRATORY IN-REACH CONSULTATION SERVICE STAFFED BY ADVANCED CLINICAL PRACTITIONERS

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10.1136/thorax-2021-BTSabstracts.285

Introduction The restructuring of Respiratory Services in response to COVID-19 led to the speciality moving to one campus, resulting in the loss of on-site respiratory services at the other campus, Consequentially there was a disparity in support provided to patients and medical staff, with inconsistent inpatient review depending on physician availability. To develop the highest quality service with equity of input a robust referral process with inpatient review led by respiratory ACPs and supported by Consultant physicians was developed.

Methods/Approach Advanced clinical practitioners provided a consistent inpatient referral service during three days per week; accepting, reviewing, discussing, and then managing referrals made via allied specialities to respiratory medicine, a role traditionally carried out by Registrars and Consultants To ensure autonomy of the role, it was essential the advice given by the ACP was safe and appropriate. Data was collected to evaluate the efficacy of the advice provided by the ACP. An additional survey was undertaken to gain evidence of national practice in this field which suggested the ACP team is at the forefront of developing innovative practice.

Results In 8 months the ACP team reviewed 419 patients; admissions were prevented advice regarding specialist treatment was provided, and timely transfer into the specialty was facilitated, including arranging follow up by community services or in consultant sub-speciality clinics. Twelve 'additional days' were covered to allow specialist registrars to attend training, improving MDT collaboration and consistency if care for patients.

Conclusion The introduction of an ACP-led referral service reduced the time from referral to patient review, freed up Consultant hours for other duties, and facilitated appropriate onward management of patients. Following the successful implementation of this ACP-led service the aim will now be to provide 5-day cover and collect more robust outcome measures to demonstrate improvement in patient outcomes.

P177 ARE WARD ROUNDS A SOURCE OF LEARNING? TRAINEES PERCEPTION OF LEARNING KNOWLEDGE, SKILLS OR ATTITUDE DURING WARD ROUNDS IN A LARGE TERTIARY CARE HOSPITAL

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10.1136/thorax-2021-BTSabstracts.286

Introduction Ward rounds (WRs) have been integral to the process of teaching and learning. WRs can also provide healthcare professionals with unique training opportunities at

Abstract P177 Table 1 Trainee's perceptions of learning knowledge, skills, or attitudes during ward rounds

Learning opportunities	Strongly agree N (%)	Agree N (%)	Neutral N (%)	Disagree N (%)	Strongly disagree N (%)
Basic sciences	13 (7.8)	46 (27.7)	41 (24.7)	40 (24.1)	26 (15.7)
History taking	37 (22.3)	77 (46.4)	27 (16.3)	16 (9.6)	9 (5.4)
Physical examination	31 (18.7)	72 (43.4)	28 (16.9)	22 (13.3)	13 (7.8)
Diagnostic investigation	49 (29.5)	89 (53.6)	17 (10.2)	5 (3)	6 (3.6)
Patient management	52 (31.3)	81 (48.8)	22 (13.3)	7 (4.2)	4 (2.4)
Documentation	27 (16.3)	67 (40.4)	47 (28.3)	20 (12)	5 (3)
Time management	22 (13.3)	64 (38.6)	48 (28.9)	22 (13.3)	10 (6)
Communication skills	45 (27.1)	78 (47)	26 (15.7)	10 (6)	7 (4.2)

the bedside. The aim of this study was to assess trainees' perception of the educational value of WRs.

Methods All trainee doctors in specialties that perform WRs (e.g. medicine, surgery) at a large tertiary care teaching hospital between October and December 2019 were invited to complete a self-administered questionnaire.

Results Total of 162 trainees participated (response rate 66%). Table 1 shows the sample's perceptions of learning knowledge, skills, or attitudes during WRs. The majority (52%) reported that WRs are educationally very useful. Trainees generally agreed that WRs were a good opportunity to learn approaches to history taking (68%) physical examination (62%), diagnostics investigations (83%) and patient management (80%). The greatest barriers to learning on WRs were; lack of time (79%), caseload (77%), emphasis to get work done (66%) and a busy ward environment (57%).

Conclusions Majority of the trainee doctors perceived ward rounds as great opportunity for all domains of learning in diagnostics, patient management, history and physical examination while lack of time, caseload and busy environment identified as obstacles to this practice.

P178 EVALUATING MEDICAL STUDENTS' TELEPHONE CLERKINGS IN THE RESPIRATORY PLACEMENT

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10.1136/thorax-2021-BTSabstracts.287

Introduction and Objectives The impact of the COVID-19 pandemic on undergraduate medical education has seen a reduced provision of learning opportunities, including face-to-face outpatient interaction. To facilitate active learning in the clinic component of the respiratory rotation, long-term patients known to the department consented to being contacted by medical students via telephone. Students elicited a telephone history, which they were able to subsequently present to their consultant supervisor for discussion and feedback. We aimed to evaluate this medium of student-patient interaction from both perspectives using survey-based responses.

Methods Two separate surveys were distributed between April and June 2021. All students who had participated in telephone history taking sessions were invited to complete an online survey. Patients were offered the choice to complete their survey via telephone, online, or on paper, with all choosing to respond via telephone call. The questionnaires employed a combination of discrete scales (e.g. the 5 point Likert scale) and free text responses.

Results 14/19 (74%) responses from patients and 15/24 (63%) responses from students were collected. A majority (89%) of patients agreed that speaking to medical students was convenient for them, and most (71%) would be inclined to engage in telephone conversations with students in the future. 100% of student responses agreed that conducting a telephone consultation helped improve their history taking ability, and the vast majority (93%) agreed that the opportunity to present and discuss their history-taking was a valuable part of the learning experience. Free text responses elucidated the subtleties of what patients and students felt to be the mutual benefits of engaging in telephone consultations.

Conclusions The scheme provided a successful opportunity for students to practise their history taking and to adapt to the unique challenges of telephone consulting. Patients reported that talking to medical students was a positive and rewarding experience. It is possible that patients and students who found their participation in the scheme to be a more negative experience were less likely to take part in feedback. These findings contain lessons for developing undergraduate education in the increasingly digitised future using telephone consultations with expert patients.

P179 A YEAR IN COVID – LOOKING AT THE MENTAL AND PHYSICAL HEALTH OF RESPIRATORY HIGH CARE UNIT (RHCU) STAFF THROUGHOUT THE COVID-19 PANDEMIC

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10.1136/thorax-2021-BTSabstracts.288

Our Respiratory High Care Unit (RHCU) was established in April 2020 in response to the COVID-19 pandemic, providing level-two care for COVID-19 patients. In one year, RHCU experienced a 54% mortality rate in patients who received Aerosol Generating Procedure.

There is concern among health-care workers of how the pandemic has affected mental health. Risk of suicide among female health professionals is 24% higher than female national average. 58% of doctors reported a detriment to their mental health since the start of the pandemic.[1]

We analysed impact on staffs' mental health after working on RHCU. Using a survey structured around Patient Health Questionnaire-9, staff retrospectively rated their mental health in April 2020, and commented on mental health in March 2021.

65 questionnaires were distributed. 53 (82%) completed. 17% were doctors, 36% nurses, others include physiotherapists, pharmacists, administrative staff and cleaners. 62% worked on RHCU for $\geq$8 months.

There was an increase in staff reporting a poor/fairly poor Mental Health Rating (MHR) (13% in 2020, 30% in 2021).

49% reported worsening MHR. Senior nurses (band 6 or above) appeared most affected, with 83% reporting a decrease in mental health, followed by doctors (56%).

Abstract P179 Table 1

RHCU Data		
Job role (%)		
- Senior doctor (registrar and above)	8	
- Junior doctor	9	
- Senior nurse (band 6 and above)	11	
- Staff nurse	25	
- HCA	17	
- Physio	11	
- Other (pharmacist, ward clerk, housekeepers, students)	19	
Time worked on RHCU (%):		
- 1–4 months	25	
- 4–8 months	13	
- 8–12 months	62	
Age of participants in years (%):		
- **18-25**	13.2	
- **26-35**	34.0	
- **36-45**	24.5	
- **46-55**	18.9	
- **56-65**	7.5	
- **>65**	1.9	
Analysis	**April 2020**	**March 2021**
Overall MHR (%):		
- Poor	4	11
- Fairly poor	10	19
- Average	25	26
- Fairly good	44	42
- Excellent	17	2
Mood symptoms – reported as half the time or more (%)		
- Depressed	4	21
- Tearful	6	27
- Anxious	18	44
- Irritable	18	40
Anxiety coming into work experienced half the time or more (%)	14	45
Lack of motivation at work experienced half the time or more (%)	10	30
Work-life balance – reported as half the time or more (%)		
- Worrying/thinking about patients outside of normal working hours	24	58
- Trouble falling asleep or sleeping too much	33	55
- Feeling overly tired after a shift	35	51
- Difficulty focusing on activities outside of work	20	43
- Strain on personal relationships	24	42
- Over/under eating	29	54
- Exercising regularly	52	50
Further analysis		
Impact on physical health (%)		
- No impact	10	
- Unsure	15	
- Little impact	49	
- Significant impact	26	
Would you continue in your current job role? (%)		
- Yes	68	
- Unsure	26	
- No	6	

There was an increase in negative mood symptoms (depressed, tearful, anxious and irritable) experienced half the time or more in 2021. Depressed mood had > 5 folds increase (4% in 2020, 21% in 2021). 44% staff reported feeling anxious half the time or more in 2021 (18% in 2020).

58% staff reported worrying about patients outside working hours half the time or more (20% in 2020).

75% reported some impact on their physical health. Worryingly, 67% senior nurses and 44% doctors were unsure or would not continue in their job role.

Overall, participants aged 36–45 were most affected, 54% reporting deterioration in MHR. Those aged 26–35 were most likely to consider leaving their current job role (39%).

Our survey highlighted the ongoing need for mental health support for staff working through the pandemic. Staff recruitment and retention is another challenge.

REFERENCE

1. British Medical Association. *Personal impact of the COVID-19 pandemic on doctors' wellbeing revealed in major BMA survey*.

P180 THE VIABILITY AND ACCEPTABILITY OF A RESPIRATORY PHYSIOTHERAPY WEEKEND LATE SHIFT SERVICE: A SERVICE EVALUATION

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10.1136/thorax-2021-BTSabstracts.289

Background From July to November 2020, Nottingham City Hospital trialled a respiratory physiotherapy weekend late shift (RWLS) service in response to the COVID-19 Pandemic, running on Saturday and Sunday from 16:00 to 21:00. It aimed to decrease emergency call-outs, improve patient flow and improve timeliness of assessment and treatment. Literature relating to the efficacy of emergency and weekend physiotherapy services in the UK is limited due to inter-service variation. Local factors serve as barriers and facilitators to the provision of these services, justifying the need to evaluate services individually.

Aims To determine the viability and staff acceptability of the RWLS. Viability was defined as the success of the RWLS in meeting its three main aims, staff acceptance was defined as its perceived success.

Method Mixed-methods design. Quantitative data was collected prospectively using a bespoke data collection form completed by staff at the end of their shift. Data included; number of patients seen, area of speciality, emergency calls attended and number of discharges per shift. An online semi-structured focus group with staff who worked the RWLS explored staff perceptions of the success and future acceptability of the RWLS, in depth.

Results The RWLS successfully reduced emergency call-outs by a mean of 1.06 call-outs per shift. Patient flow, measured by the number of interventions facilitating discharge was not directly improved, although staff felt discharge planning was initiated sooner. Staff felt the RWLS improved timeliness of assessment and treatment, but reported inefficiencies related to handover. The RWLS was well accepted by staff due to the shift's perceived benefits to patients, COVID-19 socialisation restrictions and overtime pay. Junior staff felt working the RWLS aided transition to emergency on-call work.

Concerns included maintaining staff commitment and lone-working.

Conclusion and Recommendations The RWLS appears viable, two of three main aims were met. Further investigations into patient benefit and flow, cost and handover efficiency would potentially improve the justification for implementing the service long-term. Staff accepted continuing the RWLS following the trial period. Maintenance of the service may require opt-in rostering, and promotion of the benefits to staff in light of the potential easing of COVID-19 restrictions.

P181 FINANCIAL BENEFITS OF A DEDICATED PULMONARY NODULE MULTIDISCIPLINARY TEAM MEETING: EXPERIENCE FROM A DISTRICT GENERAL HOSPITAL IN THE UNITED KINGDOM

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10.1136/thorax-2021-BTSabstracts.290

Introduction and Objectives Traditionally, pulmonary nodule surveillance was clinic-based with discussions of pulmonary nodule cases at lung cancer multi-disciplinary team meetings (MDTM). However, the increased burden of nodule discussions can increase workload when discussed at complex lung cancer MDTMs.[1] Thus, a dedicated pulmonary nodule MDTM was initiated at Ashford and St Peters Hospital (ASPH) NHS Trust with aim to determine its financial implications.

Methods We undertook a cost effectiveness analysis to compare the NHS cost of discussion of one nodule case at pulmonary nodule MDTM versus discussion at lung cancer MDTM at ASPH for 1 hour of time. We calculated the hourly cost for each member. The non-direct costs i.e., overheads of 21% were added to the total MDTM cost. Discussion of one case at MDTM takes 3 minutes on average i.e., 1 minute for radiology review, 1 minute for discussion and 1 minute for form filling and recording. The cost per case associated with discussion at nodule MDTM was compared to the costs per case at lung cancer MDTM and outpatient clinic review.

Abstract P181 Table 1 showing cost of each MDTM member for pulmonary nodule and lung cancer MDTM

Lung cancer MDTM			Pulmonary nodule MDTM	
MDTM member	MDTM members	Cost (£) per hour	MDTM members	Cost (£) per hour
Respiratory consultant	4	372.00	1	93.00
Radiologist	2	198.00	1	99.00
MDT coordinator	1	15.50	1	15.50
Thoracic surgeon	2	198.00	0	0.00
Oncologist	2	198.00		0.00
Palliative care consultant	1	87.00		0.00
Lung cancer CNS	1	28.00		0.00
Overhead allowance (21%)		230.27		43.58
Total cost of MDT/ hour	£1326.77		£251.08	

Results The cost to discuss one case at the lung cancer MDTM was £66.34, compared to £12.55 for discussion at pulmonary nodule MDTM. Therefore, the estimated cost saving was £53.79 per case if discussed at nodule MDTM as opposed to lung cancer MDTM. The pulmonary nodule MDTMs avoided the need for outpatient clinic review and was estimated to save £99.55 per follow up case [cost of follow outpatient clinic visit (112.10) minus cost of one nodule MDTM case (£12.55)] and £238.23 per new case [cost of new outpatient clinic visit (£250.78) minus cost of one nodule MDTM case (12.55)].

Conclusion To conclude, the implementation of a pulmonary nodule MDTM has resulted in massive cost savings to our organisation. If this were to be formally implemented and adopted to a regular job planned activity, the cost savings to the NHS as a whole could be substantial.

REFERENCE

1. Hardavella G, Desai S. Development of a pulmonary nodule service & clinical pathway: A pragmatic approach addressing an unmet need. *European Respiratory Journal* 2016;**48**:60. doi:10.1183/13993003.congress-2016.PA3079

P182 WHAT MAKES A HERO?

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10.1136/thorax-2021-BTSabstracts.291

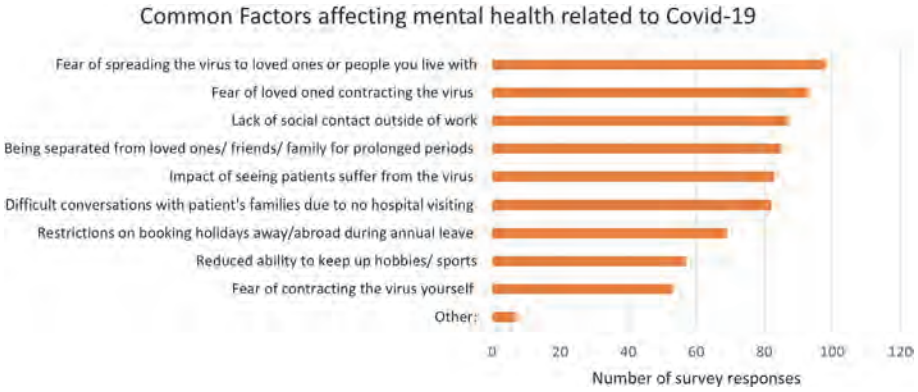
National data has shown that the COVID-19 pandemic has drastically impacted the situation of poor mental health amongst NHS staff. Severe levels of anxiety have risen from 8% pre-pandemic to 36% during the pandemic and severe stress has increased from 11% to 46%[1].

From a targeted and anonymous survey of 125 healthcare professionals at a district general hospital 83% said that their mental health had been negatively impacted by the pandemic. Interestingly, although 72% were aware of support available for mental health just over half said that they would feel comfortable seeking this support.

Throughout the pandemic NHS workers have been praised for being 'heroes'. There are growing concerns that this label could actually be detrimental, making it more difficult for staff to seek help with their mental health and exacerbating the existing issue of mental health stigma among healthcare professionals[2]. This issue is visibly evident with the vast majority of survey respondents reporting a decline in mental health, but a large proportion not feeling comfortable in seeking help.

Specific factors affecting mental health were evaluated (figure 1) and the factor with the greatest response was 'fear of spreading the virus to loved ones'. Conversely the lowest response was 'fear of catching the virus yourself'. This is an example of the inbuilt compassionate nature that healthcare professionals have, but the lack of self-compassion even in times of adversity.

There is no simple or quick fix to this issue. What is needed is a shift in culture. Putting an emphasis on wellbeing, kind communication, encouraging the use of available support and compassionate leadership are just some of the ways to managed this issue long term. This pandemic will have effects lasting long after the last case is reported and the heroes in years to come will be those who knew how to seek help and felt comfortable to do so when they needed it.



Abstract P182 Figure 1

P183 ACUTE NIV: A SIMULATION BASED QIP FOR INTERNAL MEDICAL TRAINEES

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10.1136/thorax-2021-BTSabstracts.292

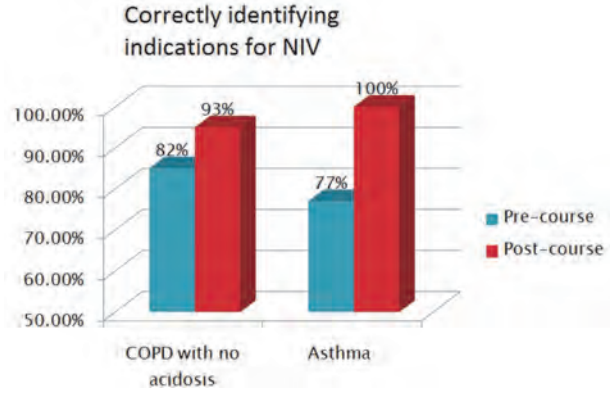
Background The use of Non-invasion ventilation (NIV) became popular over the last years.[1] BTS guidelines state that all staff involved in the use of NIV should have evidence of acute NIV training.[1] At the local level, the scale of the problem was identified by a survey sent to all the general medical registrars in our region. This questionnaire identified the shortcoming in the knowledge that surrounds NIV and the majority of the non-respiratory trainees identified a lack of training in this area.[2]

Objective Purpose of this QIP was to set up a simulation based NIV course for internal medical trainees which would lead to improvement in knowledge and management of the use of NIV.

Methods Simulation based training sessions were organized which and run on a monthly basis at the SIM suite at our teaching hospital. The candidates were asked to complete a pre and post course questionnaire. The sessions consisted of a presentation on the basics of NIV followed by simulation based scenarios.

Results On a scale of 1 to 10, the confidence level of the candidates was assessed via the questionnaire. The pre and post course mean confidence levels for selecting patients for acute NIV were 5.7/10 and 8.3/10 respectively whereas managing patients on NIV and adjusting the settings were 4.6/10 and 7.8/10 respectively. After attending the course, 95% of the candidates were able to correctly identify the absolute contra-indications of acute NIV compared to 85% prior to the course. In 2 different clinical scenarios, after attending the course, 100% and 93% of the candidates were able to identify when acute NIV is not indicated compared to 77% and 82% prior to the course.

Conclusion Our QIP was able to provide the acute NIV training recommended by the BTS. It also demonstrated that supervised training led to increased knowledge and confidence level of managing patients on NIV.



Abstract P183 Figure 1

REFERENCES

1. Davies M, et al. BTS Quality standards for acute NIV in adults. *BMJ open Respiratory Research*. Feb 2018.
2. Sagar D, et al. Acute NIV: Survey of medical Registrars. BTS, 2017.

Fighting back: optimising treatment for COVID-19

P184 IS CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP) EFFECTIVE IN THE MANAGEMENT OF COVID-19 IN PATIENTS AGED 75 AND OVER? A RETROSPECTIVE OBSERVATIONAL STUDY OF A RESPIRATORY COVID-19 CPAP UNIT THROUGH ITS SECOND WAVE

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10.1136/thorax-2021-BTSabstracts.293

Introduction There remains significant variation in treatment of COVID-19 associated respiratory failure. Although Continuous Positive Airway Pressure (CPAP) has shown to improve outcome in single centre studies, inclusion criteria for commencement of CPAP varies significantly (Ashish et al., 2020; Nightingale et al., 2020). This respiratory-led ward-level dedicated CPAP unit provided CPAP to COVID-19 patients through the 'second wave'. This study aims to evaluate the efficacy and appropriateness of CPAP for COVID-19 management in an elderly population.

Methods This retrospective observational study included all patients aged 75 and over who received CPAP for COVID-19 infection, admitted to a district general hospital between 1 October 2020 and 16 February 2021. Fifty-seven patients

were included. Data were collected from computerised clinical notes for analysis.

Results Of 57 patients (39 male and mean age 80), 47 (82.5%) patients died during admission or within 5 days of discharge. 10 (17.5%) patients survived to discharge. Non-survivors had a median CFS of 4; IQR 3–5, as did survivors (median CFS 4; IQR 3–4). Non-survivors had a median of 3 (IQR 2–4) significant comorbidities, and survivors had 2.5 (IQR 2–3.8). Median P/F (PaO2/FiO2) ratio prior to commencing CPAP was 10.5 (IQR 8.4–12.6) for non-survivors and 14.4 (IQR 12.9–18.8) for survivors. The odds of death were 6.8 (p value <0.01) in those with a severe P/F ratio (<13.3).

Conclusion This evidence indicates that CPAP used in patients aged 75 and over, particularly those with a severe P/F ratio prior to commencing CPAP, does not improve mortality. These findings can inform future decision-making and CPAP protocol development to potentially limit its use in this group. Further study of less invasive alternative management options, such as nasal high flow oxygen, is recommended.

P185 EXPERIENCE OF USING HIGH FLOW NASAL OXYGEN FIRST LINE TO TREAT HYPOXEMIC RESPIRATORY FAILURE DUE TO COVID 19 IN PATIENTS IN WHOM CRITICAL CARE ADMISSION WAS FELT TO BE NOT OF BENEFIT ON A RESPIRATORY SUPPORT UNIT (RSU) FROM OCTOBER 2020 TO MARCH 2021

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10.1136/thorax-2021-BTSabstracts.294

Introduction The efficacy of High Flow Nasal Oxygen in severe COVID 19 pneumonia is uncertain with conflicting guidance. Wirral University Teaching Hospital has used HFNO outside of critical care for some time and so in the abscnce of clear evidence we used HFNO as first line for patients with confirmed severe COVID 19 pneumonia (defined as requiring 60% FiO2 despite awake proning and appropriate treatment) in whom Critical care admission was felt to be inappropriate.

Setting Enhanced respiratory support (HFNO or CPAP) was delivered on a newly developed RSU consisting of 8 negative pressure side rooms and a 5 bed cohort area. There was a daily respiratory and critical care MDT in which severely ill COVID 19 patients were discussed and escalation plans were made. Outside of this, the decision to use HFNO was made by an on call respiratory consultant and there was daily consultant review. Only patients were placed on HFNO first line or CPAP if failing/were felt more likely to benefit from CPAP.

Results 69 patients received Respiratory support (median age 72) and had had been an IP for a median of 4.2 days prior to starting HFNO. Overall 31 (45%) of such patients survived to hospital discharge and received a mean FiO2 of 86%. Overall LOS was on average 15 days with 6 days spent on respiratory support. Markers of poor outcome include use of CPAP (survival 4/15, 27%), acute significant impairment of 2 organs (survival 4/14 28%), being over 75 (36% survival) and needing more than 90% FiO2 (28% survival). There was no increase in staff sickness, nosocomial infections or reported patient safety incidents. The overall survival rate compares well to ICNARC data for this cohort of patients and the previous pre pandemic local data for HFNO use in respiratory patients (45% from October 2020 vs 37% pre March 2020)

Conclusion HFNO appears to be a safe and effective treatment for patients with severe COVID 19 pneumonia who would not benefit from critical care support when cohorted with 24 hour senior respiratory support. The risk of nosocomial transmission is low and they can be safely managed in large negative pressure with no significant patient safety issues.

P186 SINGLE CENTRE EXPERIENCE OF TOCILIZUMAB IN COVID 19 PNEUMONIA

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10.1136/thorax-2021-BTSabstracts.295

Introduction Tocilizumab is an interleukin-6 (IL-6) receptor blocker which blocks the IL-6 signal transduction pathway reducing inflammation. It is thought to be an effective drug for patients with severe COVID-19 pneumonia. Our study sought to evaluate the benefits of tocilizumab in patients with COVID 19 pneumonia who required hospital admission.

Methods This is a retrospective analysis of 47 patients with COVID 19 pneumonia who were admitted to a single centre, London district general hospital during January and February 2021. COVID 19 patients requiring high level of oxygen to maintain oxygen saturation above 92% with one of the following criteria (C-reactive protein above 50 , ferritin above 500 mg/l , ddimer above 1000 mg/ml or LDH above 250 U/L) were eligible to receive tocilizumab. These patients were given single dose of tocilizumab 8mg/kg during first week of hospital admission. These patients were matched against 38 control patients with COVID 19 pneumonia with same SF (oxygen saturation/fiO2) ratio on admission (median SF ratio = 106.67) who received standard treatment (dexamethasone).

Abstract P186 Table 1 Clinical parameters of the COVID 19 pneumonia patients who received tocilizumab between January and February 2021

		Dexamethasone (Control group)	Dexamethasone+ Tocilizumab	p value
Total		38	47	
Age	Median [IQR]	61.5	54	
SF ratio	Median [IQR]	106.67	106.67	
Gender	Male	21	36	
	Female	17	11	
Ethnicity	British/White	25	30	
	Any other white background	1	8	
	Asian	5	11	
	Others	8	6	
Outcome	Death	17	8	**0.008**
	Need for NIV/ HFNO	9	27	**0.002**
	ITU admission	12	22	0.18
	Need for intubation	4	13	0.06
Length of Hospital Stay	Median [IQR]	6	12	**<0.001**

Findings 47 patients received standard treatment with tocilizumab. Total death was 44.7% in control group and 17% in tocilizumab group (p=0.008). 46.8% of patients in the tocilizumab group required ITU admission compared to 31.6% in the control group (p=0.18). 27.6% in tocilizumab needed intubation whereas 10.5% in control group (p=0.06). 57.5% in tocilizumab group were escalated to non invasive ventilation (NIV) or high flow nasal oxygen (HFNO) whereas only 23.7% in control group required ventilatory support (p value = 0.002). Further analysis of those in the ITU cohort revealed a mortality rate of 22.7% in the tocilizumab group and 58.3% in the control group . Length of hospital stay was twice in the tocilizumab group (12 days) vs control (6 days) (p<0.001).
Conclusion This study showed that tocilizumab may be associated with mortality benefit but no reduction in the rate of progression to intubation or need of NIV/HFNO. Further data with larger patient cohort is required to ascertain the benefits of tocilizumab in COVID 19 pneumonia.

P187 CLINICAL OUTCOMES AND TREATMENT-RELATED ADVERSE EVENTS TO TOCILIZUMAB IN SARS-COV-2 ILLNESS

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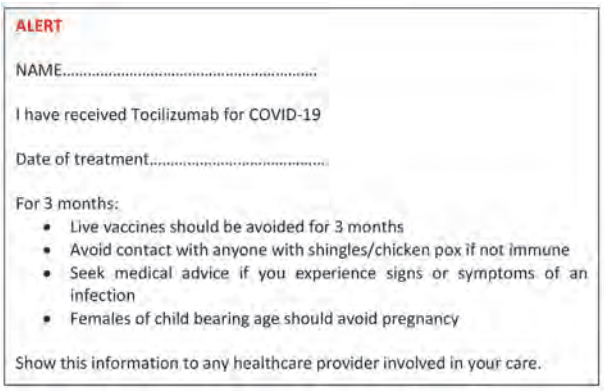
10.1136/thorax-2021-BTSabstracts.296

Background Severe SARS-CoV-2 is associated with release of Interleukin-6 and other pro-inflammatory cytokines that are markers of systemic inflammation and this response may cause or exacerbate lung injury leading to life-threatening disease. Tocilizumab, an IL-6 receptor antagonist licensed in certain Rheumatological disorders has shown to have beneficial effects on mortality and reduces the need for ventilator and organ support if used early. We evaluated the clinical outcomes and treatment –related adverse events in patients who were treated with Tocilizumab.
Method A hospital treatment protocol with inclusion/exclusion criteria, dose regimen and clinical monitoring post dose and post discharge patient alert card (figure-1) was implemented. Two clinicians had to concur to the treatment and this was limited to patients needing either Acute Respiratory Care Unit (Level-1 HDU) or ICU. Electronic medical records of all patients who had Tocilizumab between January-May 2021 were reviewed. Baseline demographics, dose regimen, respiratory support at the time of treatment and adverse events were reviewed.
Results 108 patients (age; 56±14, BMI; 32±3, males-66%) received Tocilizumab. The dosing regimen was weight based (8mg/kg, maximum 800 mg) and was given within 24 hours in 79% patients and 21% within 48 hours of admission to either ARCU or ICU. Majority (95%) received one dose and the second dose was only considered in the absence of clinical improvement. Respiratory support at the time of Tocilizumab treatment included CPAP -93% (PEEP; 8–12), 1% nasal high flow therapy and 6% invasive ventilation including ECMO. Over a third of patients had no complications but 67% had deranged liver functions (elevated ALT) but settled with supportive measures, 1% had thrombocytopenia and 1% had reactivation of TB (TB Lymphadenitis). The mortality rate in patients who received Tocilizumab was


ALERT

NAME.....

I have received Tocilizumab for COVID-19

Date of treatment.....

For 3 months:

- Live vaccines should be avoided for 3 months
- Avoid contact with anyone with shingles/chicken pox if not immune
- Seek medical advice if you experience signs or symptoms of an infection
- Females of child bearing age should avoid pregnancy

Show this information to any healthcare provider involved in your care.

Abstract P187 Figure 1 Showing the post Tocilizumab alert card

24% (n=26). Post discharge alert card to the patients and specific discharge information to primary care were provided.
Conclusion Appropriate treatment protocol and regular monitoring are needed for patients who receive Tocilizumab in severe SARS-CoV-2 illness. Clinicians should bear in mind the high incidence of treatment-related adverse events and the lack of data about long term effects. Treatment alert cards and specific discharge advice may be beneficial.

P188 TICK TOCK...WHERE AND WHEN CAN WE GIVE TOC? REVIEW OF COVID-19 PATIENTS RECEIVING TOCILIZUMAB IN A NON CRITICAL CARE SETTING

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10.1136/thorax-2021-BTSabstracts.297

Introduction The REMAP-CAP trial demonstrated the positive effects of interleukin-6 receptor antagonists (tocilizumab and sarilumab), on mortality in COVID-19 patients managed in a critical care setting.[1] Prior to this, adjuvant drug therapies such as remdesivir and dexamethasone have shown limited benefits regarding COVID-19 related mortality in patients requiring non-invasive respiratory, managed in non-critical care settings.

During the pandemic the Mater Hospital, Belfast was designed as the local COVID-19 centre. Prior to January 2021 standard ward level care included IV antibiotics, IV remdesivir, oral dexamethasone and non-invasive ventilation. Continuous positive airway pressure was used first line (commenced when FiO2 requirements exceeded 4L/min via nasal cannula). After the release of the Department of Health's position statement regarding tocilizumab for COVID-19 patients on respiratory support, a decision was taken to use tocilizumab off license in a non-critical care setting.

Our hypothesis was that COVID-19 positive patients on non-invasive ventilation who received tocilizumab in addition to standard care would have reduced hospital mortality compared with standard care alone. The REMAP-CAP trial administered tocilizumab to COVID-19 patients in a critical care setting, however we postulated that those 'less unwell' patients requiring ward level respiratory support but not 'critical care' could still benefit.
Methods Patients commenced on tocilizumab in a non-critical care setting were identified and followed up prospectively. A

control group receiving ward level standard care was established retrospectively.

Results Forty patients were recruited into both the control and treatment groups. Results were analysed using Chi-squared statistics on Microsoft Excel. The primary outcome, namely; hospital mortality, demonstrated a significant difference between the groups (p=0.048) with no discernible difference in side effect profile.

Conclusion This data supports the use of tocilizumab in patients with COVID-19 disease, noting its positive effect on hospital mortality for COVID-19 patients on non-invasive respiratory support but not requiring critical care. Moreover, the limited side effect profile witnessed suggests tocilizumab can be safely administered in a non-critical care setting.

REFERENCE

1. Gordon AC, Mouncey PR, Al-Beidh F, Rowan KM, Nichol AD, Arabi YM, *et al*. Interleukin-6 receptor antagonists in critically ill patients with COVID-19–preliminary report. *medRxiv*. 2021.

P189 USE OF ANGIOTENSIN-CONVERTING-ENZYME INHIBITORS AND ANGIOTENSIN RECEPTOR BLOCKERS IN COVID-19 INFECTION DOES NOT ADVERSELY AFFECT CLINICAL OUTCOMES INCLUDING NEED FOR NON-INVASIVE AND INVASIVE VENTILATION

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10.1136/thorax-2021-BTSabstracts.298

Introduction It has been hypothesized that use of Angiotensin-Converting-Enzyme Inhibitors (ACE-I) and Angiotensin Receptor Blockers (ARB) are associated with worse outcomes in COVID-19 through upregulation of ACE2 receptors.[1] Recent studies have shown no association between ACE-I/ARB use and increased mortality but there is limited information on other markers of disease severity such as Continuous Positive Airway Pressure (CPAP) requirement and need for intubation. We assessed the effect of ACE-I/ARB on the outcomes of COVID-19 patients.

Methods A retrospective observational study of patients with suspected or confirmed COVID-19 admitted to the respiratory units during a 1-year period. Patient demographics, clinical and medication history and clinical outcomes were extracted from written and electronic records. Primary outcomes – LOS, CPAP requirement, intensive care (ICU) admission, intubation and death – were compared between those who received ACE-I/ARB concurrently with their COVID-19 treatment and those who did not. Statistical analysis was performed using chi-squared test and odds ratio (OR).

Results Of 521 patients with suspected or confirmed COVID-19 (median age 59 years, 62.6% male), 183 (35.1%) required CPAP, 108 (20.7%) were admitted to ICU, 60 (11.5%) were intubated and 41 (7.9%) died. In total, 151 (29%) were on ACE-I/ARB treatment, most commonly for hypertension. There was no difference in median LOS between those on ACE-I/ARB treatment and those not (11 and 10 days respectively, p=0.20). There was no difference between CPAP requirement (OR 1.13, 95% CI 0.71–1.56), admission to intensive care (OR 0.64, 95% CI 0.50–1.36), intubation (OR 0.65, 95% CI 0.43–1.58) and death (OR 1.15, 95% CI 0.53–2.11) between the two groups (p>0.05).

Conclusion There was no difference in clinical outcomes between COVID-19 patients on ACE-I/ARB and those who were not, in particular with regards to need for non-invasive and invasive ventilation. Our findings support current recommendations for continued use of ACE-I/ARB in COVID-19 infection.

REFERENCE

1. Fang L, *et al*. Are patients with hypertension and diabetes mellitus at increased risk for COVID-19 infection? *The Lancet. Respiratory medicine* 2020; **8**(4):e21. doi:10.1016/S2213-2600(20)30116-8

P190 THE IMPACT OF DRUG THERAPIES ON COVID-19 MORTALITY IN A UK TERTIARY CENTRE

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10.1136/thorax-2021-BTSabstracts.299

Introduction and Objectives The availability of treatment options for Covid-19 is rapidly expanding. Whilst the efficacy data is well-established from clinical trials, real-life efficacy of drug therapies remains lacking. We aimed to compare clinical outcomes between first and second wave of Covid-19 and determine real-world effectiveness of dexamethasone on 30-day mortality.

Methods This is a retrospective observational study. Clinical data and information regarding 30-day mortality, length of stay (LOS) and Intensive Care Unit (ICU) admission of hospitalised Covid-19 patients during early first wave (10.03.2020 to 13.04.2020) and second wave (01.12.2020 to 09.02.2021) were collected. Treatment was limited to second wave and included either dexamethasone only or both remdesivir and dexamethasone. The effectiveness of dexamethasone only on 30-day mortality was measured.

Results Of 373 patients (64.3% male) during the first wave, 24.9% died within 30 days. The 30-day mortality rate was lower during the second wave (61/324, 18.8%, p-value= 0.064). Patients were younger (mean [SD], 60.0 [16.5] years) and had higher body mass index (mean [SD], 30.3 [11.0] kg/m^2) during the second wave than the first wave (68.7 [14.8] years and 28.2 [7.70] kg/m^2). In the first wave, no patients received specific drug therapy for Covid-19. However, 86.5% of patients received dexamethasone only during the second wave. The LOS for the first wave was longer (median (IQR): 5 (2–11) days) compared to the second wave (4 (2–9) days, p=0.013). ICU admission during the second wave (11.2%) was also lower than the first wave (23.4%, p<0.001). In second wave, 14.3% of patients who were given dexamethasone died within 30 days compared to 25% who had no treatment (p-value=0.088).

Conclusions In the real-world setting, there was an improvement in mortality, shortened hospital LOS and lower ICU admission rate between early first and second waves of the pandemic. The major difference in treatment strategy between the two waves was the approval of drug therapies in hospitalised patients. Dexamethasone reduced the 30-day mortality, although it did not reach statistical significance, likely due to the retrospective nature and small sample size of this study. Our findings corroborate clinical trial data on the benefit of dexamethasone therapy.

Perspectives on pleural disease

P191 THE BIOCHEMISTRY OF 'NON-SPECIFIC PLEURITIS'○

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10.1136/thorax-2021-BTSabstracts.300

Introduction Histological analysis of pleural tissue from biopsy, particularly that obtained via a thoracoscopic approach is considered the 'gold' standard in securing a diagnosis in pleural disease and is recommended as the final step in the work-up of an unexplained exudative effusion.[1] A significant proportion of biopsies return a 'non-specific inflammation and fibrosis' histological pattern, often termed 'non-specific pleuritis' or NSP. It is suggested that whilst malignant pleuritis and TB pleuritis have distinct histological features, most other causes of pleural disease yield a non-specific histological finding.[2] This study aims to further our understanding of the pleural fluid characteristics underpinning this under-researched entity.

Methods A retrospective analysis of prospectively collected data on all local anaesthetic thoracoscopies (LAT) and image guided pleural biopsy (IGPBx) at a large tertiary centre from 2014–2019.

Results Across 529 pleural biopsies, 47% (250/529) yielded a histological finding of NSP, whilst 40% (212/529) demonstrated malignant pleuritis and 5% (28/529) granulomatous inflammation.

Pleural fluid (PF) characteristics at time of presentation across malignant pleuritis and NSP groups from 2017–2019, demonstrated a significantly greater proportion of exudative effusions with malignant histology: 99% (103/104) vs 91% (96/106) (c^2 1df = 7.6, p=0.006).

In patients with an exudative effusion, a greater proportion of biochemically 'concordant' effusions (both protein and LDH meeting Light's criteria for exudate) were seen in malignant pleuritis: 81% (83/103) vs 63% (60/96) (c^2 1df = 8.03, p=0.005) (table 1).

Abstract P191 Table 1

	Malignant Histology	NSP Histology
PF Exudate	103 (99%)	96 (91%)
PF Transudate	1 (1%)	10 (9%)
Concordant Exudate	83 (81%)	60 (63%)
Discordant Exudate	20 (19%)	36 (38%)

(PF characteristics across malignant and NSP histological subtypes, concordance defined as PF protein >30 g/L and PF LDH >170 IU/L, discordance as only one of PF >30 g/L or LDH >170 IU/L)

Discussion There is significant variation in PF biochemical characteristics between NSP and malignant pleuritis. The significant increase in biochemical discordance in the former suggests distinct underlying pathophysiological mechanisms that remain poorly defined. Further research to understand the biology of NSP is required.

REFERENCES

1. Hooper C, Lee GYC, Maskell NA. Investigation of a unilateral pleural effusion in adults: British thoracic society pleural disease guideline 2010. In: BTS Pleural Dis. Guidel. 2010, II. Thorax, ii4–ii17.
2. Janssen J, Maldonado F, Metintas M. What is the significance of non-specific pleuritis? A trick question. Clin Respir J 2018;12:2407–2410.

P192 A TRAINING PROGRAMME FOR WARD BASED RESPIRATORY NURSES ON CHEST DRAIN CARE AND MANAGEMENT

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10.1136/thorax-2021-BTSabstracts.301

Background Chest drains (CD) are frequently inserted to manage pleural effusions and pneumothorax. However, they can be associated with harm (NPSA, 2020) and nurses' knowledge of chest drain care varies widely (Lehwaldt, 2005). To our knowledge there are no formal training courses for ward nurses in CD management. We aimed to develop a formalised CD training programme for ward nursing staff to improve competence, confidence and safety.

Methods We developed a structured training module for ward nursing staff. This included an e-learning module, small group simulation training and supervised practice delivered by a Practice Development Nurse. The e learning module included:

- theoretical teaching about pleural pathologies, types of chest drains and bottles,
- caring for patients during drain insertion (including NatSSIP safety checks and post-procedure care)
- performing chest drain observations and completing the care pathway
- basic CD care (dressings, CD removal, patient transfers)
- safety and troubleshooting.

A questionnaire was completed before and after the course to evaluate knowledge, ability to maintain patient safety, and confidence in CD management and course satisfaction.

Results Between April and June 2021, 50 nurses working on a respiratory ward undertook the training programme. Confidence in chest drain management improved (44% rated themselves as confident before the course, compared with 96% afterwards). Similarly, participants' perceived ability to maintain patient safety improved from 44% of participants before the course to 96% afterwards.

The course was well received, with 100% of participants agreeing or strongly agreeing that the course enhanced their knowledge of the subject matter (14% and 86%, respectively).

Discussion This study demonstrates that a combination of theory and practical skills training for respiratory ward nursing staff improves knowledge and confidence in chest drain management. The training was quick and efficient to deliver and was well received.

We hope to expand the training to other areas (AMU, ICU) through chest drain champions in these areas. Also, we plan to develop rapid, refresher training to maintain competence.

Generic national training standards and online resources would be beneficial to standardise and improve standards and safety of ward-based chest drain care.

P193 COMPLICATIONS AFTER THORACOCENTESIS AND SMALL BORE INTERCOSTAL DRAIN INSERTION: A SINGLE CENTER STUDY FROM THE NORTH EAST OF ENGLAND

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10.1136/thorax-2021-BTSabstracts.302

Introduction There are no prospective studies looking at complications of pleural procedures. Previous British Thoracic Society Pleural audits and retrospective case series inform current practice. Incidence of any complication is between 1–15%. We sought to add to the existing literature and inform local practice with regards to intercostal drains and thoracocenteses.

Methods Local Caldicott approval was sought for a review of all inpatient adult pleural procedures coded as 'T122 drainage of pleural cavity' and 'T124 insertion of tube drain into pleural cavity'. Those undergoing thoracocentesis (all with a Rocket 6Fg catheter) and intercostal drain insertion (ICD, all with Rocket 12Fg drain) were identified. Continuous variables are presented as mean (±range) and categorical variables as percentages where appropriate.

Results 1159 procedures were identified. 199 and 960 were done for pneumothorax and effusions respectively. Mean age was 68.1 years (17–97). There were 280 thoracocenteses and 879 ICDs. Bleeding occurred in 6 (0.5%), all ICDs (clotting and platelets were within normal range, 1 patient was on aspirin, 1 on aspirin and clopidogrel). All settled except for one who had intercostal artery rupture needing cardiothoracic intervention (no anti-coagulation). 9 pneumothoraces occurred (0.78%) in 7 ICDs and 2 aspirations). There were 3 definite pleural space infections (0.3%) with 3 ICDs. Fall out rates for ICDs were 35 (3%). 9 were not sutured, out of those 7 inserted in the Accident and Emergency department, out of hours. All others 'came out' due to patient factors. (previous quoted rates up to 14%). Surgical emphysema occurred in 43 (41 ICDs), 3.7%. 8 were due to fall outs and 3 required surgical intervention. There were no re-expansion pulmonary edema and no direct deaths.

Conclusions Complication rates of ICD and thoracocenteses are low. Checklists might help to remind operators of the need for suturing. Limitations of this study are its retrospective nature, and reliance on correct hospital coding.

P194 SEPTATION FORMATION FOLLOWING PLEURAL INTERVENTION

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10.1136/thorax-2021-BTSabstracts.303

Background Recurrent pleural intervention may complicate the pleural space by inducing pleural inflammation with subsequent septation formation. We evaluated our five year experience in the incidence of pleural septations in patients undergoing pleural interventions.

Method We retrospectively identified patients who underwent thoracic ultrasound (TUS) in our pleural service from our reporting database between August 2015 and February 2021. Categorical reporting of the presence of septations was used, reporting septations as either present or absent. Repeated TUS, types of pleural interventions, and time between these interventions were analysed.

Results Of the 2737 index TUS performed, we recorded whether septations were present or not in 2684 (98%) patients. Of these, septations were present in 715/2684 (26.6%: 95% CI 25–28.3%) cases.

In 297 patients with >1 TUS reports, 187 underwent an intervention at the index visit. At baseline, septations were present in 39/187 (20.9%) of these patients. Of the remaining 148/187 (79.1%) patients without septations on index scan, 24/148 (16.2%; 95% CI 10.7–23.2) reported the formation of new septations at the second TUS visit at a median [interquartile range] time interval of 21 [9–63] days.

No association was seen between the type of intervention and development of septations [chest drain 14.2% (1/7), diagnostic aspiration only 22.2% (6/27), therapeutic aspiration 15.3%(17/111) p=0.68].

No difference was observed in those patients with serial scans, not undergoing intervention, with new septations reported in 15/75 (20%) (p=0.48), while a shorter time interval between scans reporting conversion to septations (median [IQR] 7 [2.25–57] days (p=0.04)) was noted.

Conclusion Overall, in this large cohort of patients seen through our pleural service, septations were present in a quarter of baseline thoracic ultrasound examinations. Septations formed with or without intervention in around 1 in 5 patients. Understanding this further has significant implications for diagnostic and management pathways.

P195 PLEURAL EFFUSIONS ASSOCIATED WITH PERICARDITIS OR MYOCARDITIS

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10.1136/thorax-2021-BTSabstracts.304

Introduction A literature search over the last decade found 1 paper regarding pleural effusions in pericarditis/myocarditis. 94 pleural effusions were described in 177 patients (53%). They were predominantly bilateral, associated with C reactive protein (CRP) levels and female sex.[1] No local review has ever been performed. We sought to add to the literature and inform local practice.

Methods With Caldicott approval, a review of all cardiac magnetic resonance imaging (cMR) records from the local cardiological database was performed. Pericarditis/myocarditis cases were analysed further to determine presence of pleural effusions. Those were analysed for basic demographics, pleural interventions and outcomes. Continuous variables are presented as mean (±range) and categorical variables as percentages where appropriate.

Results 4368 cMRs were reviewed (July 2016-July 2020); 82 (1.9%) patients had pericarditis/myocarditis; 28 (33%) had pleural effusions on contemporaneous imaging. Mean age was 63.1 years (range 24–83); 15 were female, and 19 male. Diagnoses were viral (1), rheumatological (2), amyloidosis (2), listeria (1) and the rest idiopathic (22). 3 effusions were only left sided, 1 right sided and 24 bilateral. 7 pleural taps were performed, 1 for a unilateral effusion and 6 for one side being bigger than the other. The mean Ph 7.46 (7.33–7.6), mean LDH 210 (74–393 U/L), mean fluid protein 36.1 (19–56 g/L) [4 effusions exudative/3 transudative], mean glucose 5.8 (4.8–6.8 mmol/L), all cytologies were negative. 6 patients

underwent large volume aspirations for symptom control. 3 indwelling catheters (IPC) and 2 intercostal drains were placed for treatment refractory effusions. There was one pleural space infection in 6 months, related to an IPC. There were 3 deaths at 12 months, none related to pericarditis/myocarditis.

Conclusions Pleural effusions occur in approximately a third of patients with pericarditis/myocarditis and are predominantly bilateral. Treatment refractory cases require pleural intervention: aspirations, drains and IPCs are all viable options. Limitations of this study are its retrospective nature, manual searching techniques and incomplete data related to values such as CRP. Our sample size is also too small to infer meaningful data on aetiology, pleural fluid biochemistry and gender predominance. A prospective study is thus warranted.

REFERENCE

1. https://pubmed.ncbi.nlm.nih.gov/30868443/

P196 PNEUMOTHORAX AND CARDIAC DEVICE IMPLANTATION: A 10 YEAR RETROSPECTIVE REVIEW FROM A SINGLE CENTRE IN THE NORTH EAST OF ENGLAND

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10.1136/thorax-2021-BTSabstracts.305

Introduction In patients undergoing pacemaker (PPM) implantation or cardiac resynchronization, pneumothorax incidence was 1–6%, and commoner in women over 80 years of age with chronic obstructive pulmonary disease (COPD).[1 2] No local review has ever been performed. We sought to add to the literature and inform local practice.

Methods Local Caldicott approval was sought for a review of cardiac device implantations from the local cardiological database. Those identified as being complicated by a pneumothorax on radiology reports were analysed further with basic demographics, pleural interventions and outcomes. Continuous variables are presented as mean (±range) and categorical variables as percentages where appropriate.

Results 2056 implantation episodes from Jan 2010-Dec 2020 were reviewed. 70 pneumothoraces (3.4%) were identified, all related to PPM insertion. Mean age was 68.1 years (17–97), 39 were female, and 31 male. All pneumothoraces were on the side of the PPM (3 right, 67 left). 36 pneumothoraces were small, and 34 large according to British Thoracic Guidance criteria. 56 patients with minimal symptoms (30 were large pneumothoraces) were observed initially, with 5 requiring intercostal drainage (ICD) due to enlargement of pneumothorax and progressive symptoms. 14 pneumothoraces were treated with ICD as 1st line treatment: mean age was 78 years (69–89) and 8 had concurrent COPD. 5 pneumothoraces were large and all patients had significant symptoms. All pneumothoraces resolved within 6 weeks on follow up radiographs. There was no associated mortality.

Conclusions Pneumothorax rates following cardiac device implantation are low. Irrespective of size, such iatrogenic pneumothoraces with minimal symptoms can often be observed with adequate safety netting. Limitations of this study are its retrospective nature and manual searching techniques. Specific reasons for causing a pneumothorax such as excessive lead manipulation were unable to be identified retrospectively. A prospective study is thus warranted.

REFERENCES

1. https://doi.org/10.1093/europace/eus054
2. https://doi.org/10.1161/circulationaha.110.976076

P197 SECONDARY SPONTANEOUS PNEUMOTHORAX: EXAMINING THE EQUIPOISE

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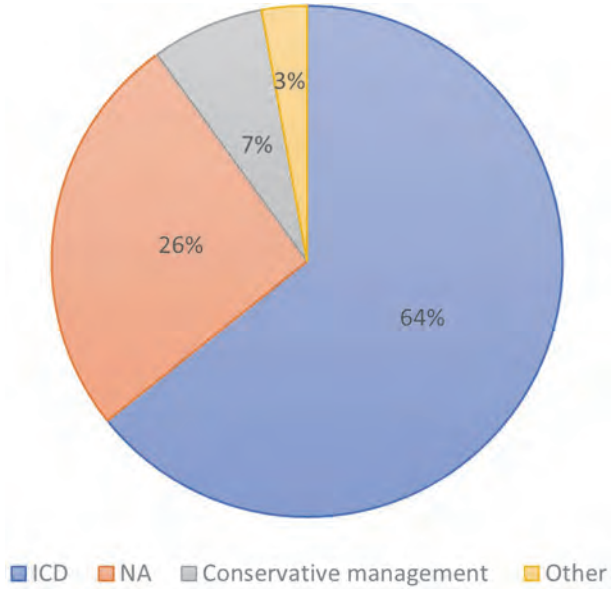
Introduction and Objectives Current BTS guidelines recommend intercostal chest drain (ICD) for management of large secondary spontaneous pneumothorax (SSP) on the presumption that needle aspiration (NA) is less likely to be successful.[1] This premise has been challenged by a randomised control trial (RCT) by Thelle et al, which found NA halved the length of hospitalisation with fewer complications compared to ICD in patients with SSP.[2] We conducted a study to examine current views on management of SSP in the UK.

Methods Respiratory and emergency healthcare staff were invited, via personal email and via social media, to complete an online survey. The composed of 5 questions on a clinical vignette of a symptomatic patient with large (>2cm at hilum) SSP with no signs of respiratory compromise.

Results There were 70 responders: 64% from emergency medicine and 23% respiratory medicine. 47% were consultant grade; 44% doctors in training. 64% stated they would manage this patient with an ICD; 26% with NA; 7% with conservative care. For responders who choose ICD, the main factor influencing their decision was current clinical guidelines (64%), followed by higher anticipated success rate with chest drain (24%); familiarity of chest drain (8%) and concerns about patient safety (4%). Clinicians would be more likely to choose NA if the patient had minimal symptoms (57%), if there was a smaller pneumothorax (72%) or if there was patient preference for NA (59%), and less likely with greater severity of lung disease (60%). Most responders (89%), when presented with the Thelle et al study, would consider taking part in an RCT of NA versus ICD in SSP.



Abstract P197 Figure 1

Conclusion Our survey highlights that whilst most responders would manage a symptomatic patient with a large SSP with a chest drain, over a third would choose a less invasive approach. Current guidelines appear to be the leading justification. There is current equipoise in the management of SSP.

REFERENCES

1. MacDuff A, Arnold A. Management of spontaneous pneumothorax: BTS Pleural Disease Guideline 2010. *Thorax*. 2010;**65**(Suppl 2):ii18–31.
2. Thelle A, Gjerdevik M. Randomised comparison of needle aspiration and chest tube drainage in spontaneous pneumothorax. *ERJ*. 2017;**49**(4):1601296.

P198 OUTCOMES OF AUTOLOGOUS BLOOD PLEURODESIS IN PERSISTENT AIR LEAK: AN EIGHT-YEAR RETROSPECTIVE STUDY

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Introduction and Objectives Autologous blood pleurodesis (ABP) is one of the treatment options for recurrent pneumothorax and postoperative persistent air leak (PAL) following lobectomy.

We aimed to assess the effectiveness of ABP in PAL.

Methods Patients who underwent ABP from January 2013 to June 2021 were identified retrospectively through the procedure coding database and review of the pleural booking diary. Data was collected on demographics and treatment outcomes. Success was defined as cessation of PAL permitting drain removal within seven days of ABP.

Results 68 patients underwent ABP averaging 8.5 patients per year. Mean age was 63 (SD 17.23). 18/68 (26.5%) patients were females.

Results are summarised in table 1.

Conclusion In this selected population, ABP is effective in the management of both surgical and medical PAL. Our data suggests high success rate not only as a first line therapy for PAL but also in cases where talc pleurodesis or endobronchial valve placement has failed.

Abstract P198 Table 1 Results

Variable	Number
Number of attempts at ABP, median (range) n=68	1 (1–3)
Indications for ABP (%)	
Post thoracic surgery	48/68 (70.6)
Secondary pneumothorax	14/68 (20.6)
Empyema with bronchopleural fistula	4/68 (5.9)
Other	2/68 (2.9)
Volume of blood used for ABP, mean (SD), ml n=56	55.3 (16.8)
Time to cessation of PAL, median (range), days n=47	3 (1–7)
Size of chest tube (%)	
≥20 F	52/68 (76.5)
≥12 - <20 F	13/68 (19.1)
<12	3/68 (4.4)
Inpatient ABP outcome (%) n=66	
Secondary pneumothorax	
Cessation of PAL	11/14 (78.6)
Persistence of PAL	2/14 (14.3)
Reduction in PAL	1/14 (7.1)
Post thoracic surgery	
Cessation of PAL	32/48 (66.7)
Persistence of PAL	12/48 (25)
Reduction in PAL	4/48 (8.3)
Empyema with bronchopleural fistula	
Cessation of PAL	4/4 (100)
Success rate of ABP as a second line therapy (%) n=23	
Post talc pleurodesis	8/10 (80)
Post endobronchial valve	6/8 (75)
Post thoracic surgery	1/5 (20)
Treatment following failure of ABP (%)	8/68 (11.8)
Thoracic surgery	3
Endobronchial valve	2
Talc pleurodesis	2
Complications (%)	
Pleural infection	8/68 (11.8)
Tube blockage	1/68 (1.5)
Severe chest pain	1/68 (1.5)
Desaturation	1/68 (1.5)
Recurrence of PAL within one year (%)	1/19 (5.2)

P199 THE ROLE OF MULTI-LEVEL INTERCOSTAL NERVE BLOCK IN LOCAL ANAESTHETIC THORACOSCOPY (LAT)

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Introduction Intercostal nerve block (ICNB) has long been used as an adjunct to analgesia in thoracic surgery. It provides effective pain relief and a reduction in morphine requirement.[1]Local anaesthetic thoracoscopy (LAT) is performed by respiratory physicians usually under conscious sedation with local anaesthesia at the port insertion site. This however does not sufficiently anaesthetise the parietal pleura and patients can experience pain during biopsies.

Objectives To compare LAT with multi-level ICNB versus standard care to determine if it reduces pain, length of stay (LOS) and analgesia use.

Methods Prospective analysis of patients undergoing LAT between January and June 2021. In the ICNB group, Levobupivacaine 0.5% 10ml was mixed with Xylocaine 1% (lidocaine with adrenaline 1:200,000) 10ml and administered as 4ml per rib space (up to 5 rib spaces) at the angle of the rib immediately before LAT. Standard care received a maximum of 20ml Xylocaine 1% at the LAT port site only. Visual Analogue Score(VAS) for pain(0–100mm) was measured at 1 and 2 hours post LAT and daily including a record of total analgesia used.

Results 20 patients [10 ICNB vs 10 standard care group]. Mean age 68 years with 70% males. The most common diagnosis was mesothelioma(35%) and fibrinous pleuritis(35%). There were no complications associated with ICNB.

Conclusions Patient reported VAS for pain in the ICNB group was reduced by 41mm at 1 and 2 hours post LAT and 38mm at day 1 ($p<0.05$) compared to standard practice. [Minimal Clinically Important Difference >16mm].[2] Mean LOS was reduced by 58% in the ICNB group ($p<0.05$). Oral morphine and paracetamol use reduced by 40% and 56%, respectively.

Abstract P199 Table 1

Mean VAS(0 to 100mm)	Standard group (n=10)	ICNB group (n=10)	P value
1 hour post LAT	64	23	**0.002**
2 hour post LAT	64	23	**0.002**
Day 1	55	17	**0.001**
Day 2	34	NA	NA
Length of stay (Mean/Median,days)	2.4/2	1/1	**0.009**
Total analgesia use (mean)			
Oral morphine,mg	38.5	23	0.347
Codeine,mg	34.4	38.6	0.912
Paracetamol,g	3.4	1.5	**0.006**

In this small cohort, ICNB potentially has a role in reducing pain, LOS and analgesia use and allows LAT to be more tolerable, and may widen the scope of procedures possible during LAT.

REFERENCES

1. Taylor R, *et al*. Postoperative analgesia in video-assisted thoracoscopy:the role of intercostal blockade. *J Cardiothorac Vasc Anesth*. 2004 Jun;**18**(3):317-21.
2. Dahlberg GJ, et al. Minimal clinically important difference for chest discomfort in patients undergoing pleural interventions. *BMJ Open Respir Res*. 2020 Dec;7(1): e000667.

Asthma: phenotyping and the response to biologics

P200 URINARY LEUKOTRIENE E4 AS A BIOMARKER IN NSAID EXACERBATED RESPIRATORY DISEASE (N-ERD): A SYSTEMATIC REVIEW AND META-ANALYSIS

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Introduction NSAID exacerbated respiratory disease (N-ERD) - formerly aspirin-induced asthma (AIA), is an asthma phenotype characterised by increased leukotriene production. Urinary Leukotriene E4 (uLTE4) indicates cysteinyl leukotriene production and activity.
Objectives To evaluate whether baseline uLTE4 in N-ERD are different from post-aspirin challenge $uLTE_4$ in N-ERD and whether baseline $uLTE_4$ in N-ERD are different from aspirin-tolerant-asthma (ATA) patients and healthy controls (HC).
Methods A systematic literature search (Medline, EMBASE, EMCARE, CINAHL, PsychINFO) was performed from database inception to January 2021, to identify 1) studies reporting baseline $uLTE_4$ in both AIA/N-ERD and ATA asthmatics, and 2) $uLTE_4$pre- and post-aspirin challenge tests. Meta-analysis was performed (i.e. pooled standardised mean difference (SMD) with 95% confidence intervals (95% CI)) and risk of bias assessed (implementing Cochrane Handbook for Systematic Reviews of Diagnostic Test Accuracy).
Results Of 522 study records reviewed, qualitative synthesis and meta-analysis were performed on $n=36$ and $n=33$ studies respectively (Meta-analysis; $n=$ 1273 AIA, 1305 ATA, and 582 HV across 8 countries). Criteria for aspirin intolerance were (i) positive aspirin challenge alone ($n=26$), (ii) convincing clinical history ($n=2$), and (iii) either challenge or history ($n=8$). Methodologies used for $uLTE_4$ analysis were (i) Amersham-enzyme immunoassay (A-EIA) ($n=8$), (ii) Cayman-enzyme immunoassay (C-EIA) ($n=18$), (iii) mass spectrometry (MS) ($n=5$), and (iv) radioimmunoassay (RIA) ($n=6$).$uLTE_4$ was higher in AIA *vs* ATA (SMD: 0.80; 95% CI: 0.71–0.89) and distinguished ATA from HC (SMD: 0.52; 95% CI: 0.23–0.81). For studies reporting $uLTE_4$ at baseline and post-challenge, $uLTE_4$ increased following aspirin challenge in AIA ($n=12$, SMD: 0.56; 95% CI: 0.26–0.85) but not ATA ($n=8$, SMD: 0.12; CI: -0.08–0.33). Risk of bias was acceptable across all studies, however 30.6% of quality assessment items were unfulfilled.
Conclusions This comprehensive systematic review and meta-analysis showed that $uLTE_4$ is significantly higher in N-ERD than ATA or HC. Likewise, people with N-ERD have greater increases in uLTE4 following aspirin challenge. Because of heterogeneity, and lack of original data point reporting, diagnostic accuracy evaluation for $uLTE_4$ was not possible. In patients not fit to undergo confirmatory challenge tests for N-ERD, $uLTE_4$ can serve as a useful adjunct to diagnostic process.

Please refer to page A193 for declarations of interest related to this abstract.

P201 TO WHAT EXTENT DOES THE PROTOTYPE ORACLE SCALE PREDICT TREATMENT BENEFITS? PREDICTED VERSUS OBSERVED IMPACT OF ANTI-INFLAMMATORY TREATMENTS

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Background We have derived a prototype asthma attack risk scale (ORACLE)[1] centred on the peripheral blood eosinophil count and exhaled nitric oxide (FeNO). We speculate that the excess risk identified by raised biomarkers would be equivalent to the benefits of specific anti-inflammatory treatment.
Objective To assess whether the treatment effect conferred by raised blood eosinophils and FeNO is predicted by ORACLE.
Methods Observed biomarker-stratified annualised severe asthma attack rates of patients randomised to control and anti-inflammatory treatment arms were extracted from the Novel START (as needed salbutamol *vs* low dose regular or as needed ICS), CAPTAIN (fluticasone furoate (FF) 100 *vs* 200µg/d-containing arms), QUEST (placebo *vs* Dupilumab 200mg/2w), and DREAM (placebo *vs* any mepolizumab) studies. Observed rate ratios were calculated between control and active arm attack rates in patients with any raised type-2 biomarker at baseline (blood eosinophils $\geq 0.15\times10^9$/L or FeNO ≥ 25 ppb) and those with none (blood eosinophils $<0.15\times10^9$/L and FeNO <25 ppb). The predicted biomarker-stratified attack rates were calculated based on our hypothesis that type-2 high asthma has an anti-inflammatory treatment effect equal to moving from any biomarker high stratum's predicted risk to the biomarker low stratum's predicted risk.
Results The Table shows the observed *vs* ORACLE-predicted biomarker-stratified annual asthma attack rates and anti-

Abstract P201 Table 1 Predicted *vs* observed impact of anti-inflammatory treatments in patients with a baseline blood eosinophil count $\geq 0.15\times10^9$ cells/L or FeNO $\geq$25 ppb

Annual severe asthma attack rate		Included trial: control *vs* active interventions (*n*)				Weighted mean% reduction
		Novel START[2] Salbutamol (*n*=201) *vs* Any ICS (*n*=377) *†	CAPTAIN[3] FF100 (*n*=903) *vs* FF200 (*n*=909)*	QUEST[4,5] Placebo (*n*=514) *vs* Dupi 200 (*n*=484)	DREAM[5] Placebo (*n*=145) *vs* Any Mepo (*n*=392)	Control (*n*=1763) *vs* Active (*n*=2162)
Observed	Control arm	0.05	0.40	1.07	2.46	
	Active arm	0.03	0.24	0.41	1.19	
	% Reduction	35%	38%	62%	52%	**46%**
Predicted	Control arm	0.13	0.32	0.93	1.28	
	Active arm	0.07	0.19	0.53	0.74	
	% Reduction	42%	42%	42%	42%	**42%**

*For both the Novel START and CAPTAIN studies, data of patients with a baseline FeNO of <20 ppb were regrouped into the <25 ppb group, as the difference of 5 ppb in FeNO is not clinically relevant. †For Novel START, only the percentage of patients with one or more severe attacks(s) in the 52-weeks of follow-up was reported so a rate was imputed as -log10(1 -%incidence). Dupi 200, dupilumab 200 mg/2w; FF, fluticasone furoate; ICS, inhaled corticosteroid; Mepo, mepolizumab. [2]Pavord *et al*. Lancet Respir Med 2020;8:671–80; [3]Lee *et al.* Lancet Respir Med 2021;9:69–84; [4]Busse *et al.* Lancet Respir Med 2021: in press; [5]Shrimanker *et al.* Am J Respir Crit Care Med 2019;200:1308–12.

inflammatory treatment benefits. For the 3925 patients with at least one type-2 biomarker high at baseline, the observed *vs* predicted frequency-weighted mean rate ratios were 0.54 *vs* 0.58 (table 1); the corresponding percentages reduction in asthma attacks were 46% and 42%, respectively. In contrast, the 814 patients with both biomarkers low at baseline had observed *vs* predicted rate ratios of 0.86 *vs* 1.00; the corresponding percentages reduction in asthma attacks were 14% and 0%, respectively. The relative risk associated with biomarkers was consistent across populations, but the absolute risk and the treatment benefit conferred by type-2 biomarkers was greater in a population at higher background risk.

Conclusion The prototype ORACLE scale predicts the excess risk conferred by raised biomarkers which is removed by anti-inflammatory therapy in trial populations.

REFERENCE

1. Couillard, *et al.* https://ats2021.info/qybeISJ

Please refer to page A193 for declarations of interest related to this abstract.

P202 REAL LIFE EXPERIENCE WITH MEPOLIZUMAB AND COMPARISON WITH OMALIZUMAB IN CHILDREN WITH SEVERE ASTHMA

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Introduction Mepolizumab (anti-IL-5) and omalizumab (anti-IgE) are the only biologics licensed for asthma in children from age 6. Omalizumab is of known effectiveness, but mepolizumab lacks paediatric efficacy data. We hypothesised that mepolizumab and omalizumab are equally effective treatments for paediatric severe asthma.

Methods Single-centre, observational study of children 5–18years with severe asthma, confirmed following multi-disciplinary (MDT) assessment, started on mepolizumab (since 2019) or omalizumab (since 2008). Baseline exacerbations before biologic initiation were collected retrospectively. Prospective monthly assessments recorded exacerbations ($\geq$3 days systemic steroid or hospital attendance), lung function with spirometry, exhaled Nitric Oxide (FeNO), Asthma Control Test (ACT) or childhood ACT (cACT) and mini-Paediatric Asthma Quality of Life Questionnaire (mini-PAQLQ). MDT assessed response to mepolizumab 6-monthly and omalizumab 4-monthly including comparison to their 6 or 4-monthly baseline exacerbations.

Results Seventy-six children initiated mepolizumab (n=16) or omalizumab (n=60). Both groups had similar baseline treatment, clinical assessments and exacerbations. A greater proportion of mepolizumab group were female (81% vs 35%).

56.7% of children continued omalizumab following 4-month trial and 75% continued mepolizumab after 6-month trial.

Median (IQR) monthly exacerbations/person decreased significantly after 4-month omalizumab trial compared to 4-months pre-treatment (baseline: 0.75 (0.438–1), 4-month: 0.25 (0–0.5), P=0.0003); median (IQR) monthly exacerbations/person non-significantly decreased in the mepolizumab group after 6-month trial (baseline: 0.333 (0.167–0.792), 6-months:0 (0–0.333), P=0.2344).

A subgroup of 6 children experienced no exacerbations after 6 months of mepolizumab and reduced monthly exacerbations after 1-year (P=0.007). Pre-treatment exacerbations and measures of eosinophilic airway inflammation did not distinguish mepolizumab responders and non-responders.

Children prescribed omalizumab experienced significant reduction in FeNO and improved mini-PAQLQ scores and proportion of patients with controlled ACT/cACT after 4-months. Children prescribed mepolizumab experienced non-significant improvements in mini-PAQLQ scores and proportion of patients with controlled ACT/cACT scores after 6-month trial (*table 1*).

When median change/person was compared between biologics, there was no significant difference for any parameter.

Conclusion There were significant improvements in asthma outcomes with omalizumab but not mepolizumab. This may be due to sample size however these data underscore the need

Abstract P202 Table 1 Multidomain assessment for children before and after 6-month mepolizumab trial and 4-month omalizumab trial

Domain assessed		Mepolizumab	Omalizumab	Comparison between biologics: P-value
Monthly exacerbation rate	Baseline	0.333 (0.167 - 0.792) n=12	0.75 (0.5 - 1) n=31	0.218
	End of biologics trial	0 (0 - 0.333) n=12	0.25 (0 - 0.5) n=31	
	Paired comparison of baseline and end of trial P-value	0.234	***0.0001****	
	Median (IQR) change/person	-0.167 (-0.583 – 0)	-0.5 (-0.5 – 0)	0.328
Mean ±SD% predicted Forced Expiratory Volume in 1 second	Baseline	86.9 ±24.8 n=7	81.2 ±19.9 n=53	0.3
	End of biologics trial	91.9 ±25.7 n=7	82.4 ±18.6 n=53	
	Paired comparison of baseline and end of trial P-value	0.381	0.607	
	Median (IQR) change/person	1 (-4 – 8)	3 (-8 – 12.8)	0.949
Median (IQR) Fractional exhaled Nitric Oxide - parts per billion	Baseline	65 (18.5 – 101) n=5	44 (21.8 – 77.8) n=38	0.698
	End of biologics trial	26 (15 - 54) n=5	27 (14 – 50) n=38	
	Paired comparison of baseline and end of trial P-value	0.438	***0.0499****	
	Median (IQR) change/person	-11 (-80 – 16))	-6.68 (-35.2 – 8.78)	0.755
Median (IQR) Mini-Paediatric Asthma Quality of Life Questionnaire score	Baseline	6.04 (3.56 – 7) n=8	4.19 (3.23 – 5.42) n=32	0.083
	End of biologics trial	6.69 (4.57 - 7) n=8	6.05 (4.11 – 6.59) n=32	
	Paired comparison of baseline and end of trial P-value	0.188	***0.0008****	
	Median (IQR) change/person	0.115 (0 – 1.75) n=8	0.885 (-0.263 – 2.11) n=32	0.550
Proportion of patients with Asthma Control Test or childhood Asthma Control Test ≥20 – No. (%n)	Baseline	3 (20) n=15	8 (14) n=57	0.277
	End of biologics trial	5 (55.6) n=9	15 (34.9) n=43	
	Change from baseline P-value	0.0994	***0.0175****	

Normality tested with Shapiro-Wilkes.
Normal data compared with paired t-test, non-normal with Wilcoxon signed-rank and categorical data with Fisher's exact test.
†mepolizumab and omalizumab exacerbation baselines are the 6 and 4 months before treatment initiation respectively.
*denotes $P \leq 0.05$, ** denotes $P \leq 0.001$ and *** denotes $P \leq 0.0001$.

for large-scale paediatric mepolizumab studies, especially given evidence of low Type-2 cytokines in children with severe asthma.

P203 EFFECTIVENESS OF ANTI-IL4R THERAPY FOLLOWING SUBOPTIMAL RESPONSE TO ANTI-IL5/5R THERAPY IN SEVERE EOSINOPHILIC ASTHMA

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Introduction Dupilumab is an anti-IL4R monoclonal antibody (mAb) with proven efficacy in severe eosinophilic asthma (SEA). We previously reported that a suboptimal response to the eosinophil-targeting anti-IL5/5R mAbs mepolizumab and benralizumab is seen in 27% and 14% of patients with SEA respectively.[1,2] The mechanism of this is not well-understood. It is unknown whether such patients respond in a clinically meaningful way following a switch to dupilumab.

Methods We performed a retrospective analysis of the clinical effectiveness of dupilumab (minimum 6 months treatment) in patients with SEA at our tertiary severe asthma centre who had failed to adequately respond to at least one of the anti-IL-5/5R mAbs. Change in the annualised exacerbation rate (AER), maintenance oral corticosteroids (mOCS) requirements and ACQ-6 was recorded.

Results Twenty-one patients (mean age 43.5, 71% female, 70% atopic) were included in the analysis. 9/21(42.9%) had co-morbid nasal polyposis and 3/21(14.3%) had eczema. The baseline FeNO was 62.5(38–87)ppb. 15/21 were switched from benralizumab (including 7/15 who had previously failed mepolizumab); 5/21 from mepolizumab and 1/21 from reslizumab. 3/21 had previously failed omalizumab prior to a switch to an anti-IL5/5R mAb. Fifteen patients were receiving mOCS at the time of commencing dupilumab.

At six months, the daily median mOCS dose fell from 10mg (6.25–22.5mg) to 3mg (0–7.5mg), $P<0.002$. ACQ-6 improved by 1.04 units from 2.94±1.31 to 1.90±1.40, $p=0.037$. There was a trend towards improvement in AER from 1.56±1.50 to 0.75±1.24, $p=0.063$. Median blood eosinophil count rose from 0.0(0–0.2) to 0.5(0.3–1.2), $p<0.001$.

One patient discontinued dupilumab during the follow-up period.

Conclusion A minority of individuals with SEA have a suboptimal response to eosinophil-targeted therapy with an anti-IL5/5R mAb. We report significant clinical improvements following initiation with dupilumab suggesting an important role for IL-4/-13 in these patients. The exact mechanisms require further research and are likely to lead to a reclassification of T2-high sub-phenotypes.

REFERENCES

1. Kavanagh JE, d'Ancona G, Elstad M, *et al*. Real-world effectiveness and the characteristics of a 'super-responder' to mepolizumab in severe eosinophilic asthma. *Chest*. 2020Aug;**158**(2):491–500.
2. Kavanagh JE, Hearn AP, Dhariwal J, *et al*. Real-world effectiveness of benralizumab in severe eosinophilic asthma. *Chest*.2021;**159**(2):496–506.

P204 COVID-19 IN THE ABSENCE OF EOSINOPHILS: A CASE SERIES OF CONFIRMED INFECTION WHILST ON TREATMENT WITH BENRALIZUMAB

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Background Blood eosinopaenia was one of the earliest reported findings in hospitalised patients with COVID-19, questioning whether eosinophils could have an anti-viral or deleterious role in the immune response against SARS-CoV2. Benralizumab is an anti-IL5R monoclonal antibody licensed for the treatment of severe eosinophilic asthma (SEA) and causes the near-complete depletion of blood and tissue eosinophils. As such, it offers the opportunity to explore the impact of eosinopaenia at the time of infection on outcome with COVID-19.

Method Patients started on treatment with benralizumab (up until April 2021) for SEA at our regional asthma centre were contacted by telephone throughout May and June 2021 to establish whether they had experienced a confirmed (PCR-positive) SARS-CoV2 infection since commencing benralizumab. Clinical and demographic characteristics were recorded along with the outcome of infection, including the need for hospitalisation or intensive care admission. Patients requiring hospitalisation were compared to those experiencing mild infections.

Results Data on 268 patients treated with benralizumab was collected with 24/268 (9%) confirming SARS-CoV2 infection with a positive PCR test. Of these 18/24 (75%) experienced mild infections that did not require hospitalisation. Of the 6/24 requiring hospitalisation, the median (IQR) length of stay was 6 (1–8) days. No patients required ICU admission or mechanical ventilation. There was no significant difference in baseline characteristics between hospitalised and non-hospitalised patients. However, it is noteworthy that a higher proportion of hospitalised patients were male (50.0% vs 38.9%) and had a higher mean BMI (32.1 vs 29.5).

Discussion In the context of drug-induced eosinopaenia with benralizumab, 75% of patients with severe asthma experienced mild COVID-19 disease. This is likely to be an underestimate given that other patients may have experienced an asymptomatic infection or not pursued PCR testing in the context of mild infection. Although caution is needed due to the small sample size, these results do not support a significant role for eosinophils in SARS-CoV2 infection.

P205 ELECTIVE INPATIENT SYSTEMATIC EVALUATION OF DIFFICULT TO TREAT ASTHMA; CASE SERIES DEMONSTRATING THE CLINICAL VALUE AND IMPROVED PATIENTS OUTCOMES

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Background Whilst the assessment and management of difficult to treat asthma (DTA) is largely conducted in outpatient settings, this seems inadequate for a minority of patients presenting with complex disease and high healthcare utilisation. Structured multidisciplinary inpatient assessment for this group may delineate the main cause/s of their disease and allow planning and effective management strategies.

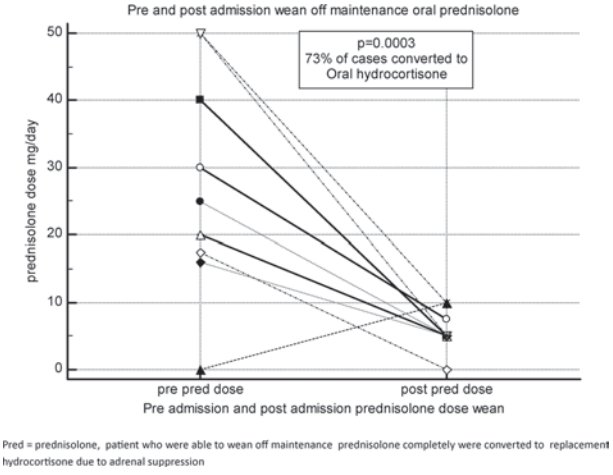
Aim To assess the Impact of elective admission for assessment and management of difficult to treat asthma patients presenting with frequent hospital admissions and/or excessive oral corticosteroids (OCS) dependency.

Methods Patient who were electively admitted and had multidisciplinary structured inpatient assessment at our tertiary severe asthma centre were considered for this analysis. Demographics and clinical details were retrieved from patients' medical and electronic records including the local dendrite system registry. Standard statistics were applied.

Results We included 21 patients, 81% females (17/21), mean age 41.6 years (23–73), mean BMI 35±10 kg/m^2, pre-admission prednisolone dose was 29.1±15.3mg/day, mean hospital admissions in the preceding year was 6.9±5.2, and the proportion with ITU admission ever was 71.4%.

The mean length of stay was 11.4 days (range 5–21) in which asthma diagnosis was confirmed in 67% of cases but severe asthma was excluded in the majority (70%) and only 30% of patients had high type 2 inflammation. This allowed significant reduction of maintenance prednisolone dose to a mean of 5.6±2.6 mg/day (figure 1) and 73% of cases were converted to replacement hydrocortisone. The primary drivers of symptoms were breathing pattern disorder (67%), inducible laryngeal obstruction (42%), excessive dynamic airway collapse (42%), and multiple diagnoses were often observed (median comorbidities 4.5, 95%CI 4–5.6).

Conclusions In this study we observed significant benefit to patients in establishing the correct diagnosis, revision of treatment and reduction of dependency on maintenance oral



Abstract P205 Figure 1

corticosteroids. Research is required to define the criteria for patients who would benefit from such systematic inpatient assessment and the longterm outcomes of such intervention.

P206 UTILITY OF ADHERENCE CHECKS IN PATIENTS WITH SEVERE ASTHMA ELIGIBLE FOR BIOLOGICS: A SINGLE CENTRE RETROSPECTIVE ANALYSIS

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Introduction United-Kingdom guidelines require good adherence to qualify for biologics, but reports suggest 25% of patients are nonadherent at time of initiation. The extent to which collaboration with a clinical pharmacist allows better fulfilment of guideline criteria has not been established.
Methods We retrospectively analysed adherence checks done in the Oxford Special Airways Clinic (Oxford, UK) prior to initiation of biologic treatment for severe asthma between Dec 2013 and Aug 2020. Adherence to inhaled corticosteroid and maintenance oral corticosteroids (OCS) was defined as $\geq$75% of prescriptions collected out of the total expected in 1 year. Other guideline criteria for biologics are $\geq$3 OCS bursts and/or $\geq$50% of previous year on maintenance OCS in optimally-treated severe asthma.
Results 280 of 289 patients on biologics had a pre-biologic adherence check available. The median adherence to ICS was 100% (IQR: 83%-100%) and the median number of asthma attacks in the previous year was 3 (IQR 1–6). Overall adherence and compliance with pharmaceutical criteria for biologics was shown in 249 patients (89%).
Conclusion An adherence check by a clinical pharmacist prior to initiating a biologic for severe asthma is associated with 89% compliance to prescription guidelines, emphasising the importance of multidisciplinary work.

Please refer to page A193 for declarations of interest related to this abstract.

P207 STEROID REDUCTION WITH OMALIZUMAB IN SEVERE ALLERGIC ASTHMA

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Introduction Omalizumab is a subcutaneous monoclonal antibody (MAB) which is licenced in the treatment of severe persistent allergic asthma. It works by binding to IgE, preventing activation of mast cells and basophils and reducing release of inflammatory mediators. The anti-IL-5 MABs used in severe asthma have been widely researched to show their steroid reducing capabilities. According to the NICE guidelines for omalizumab, patients require at least 4 courses of prednisolone to qualify. Little research has been done into its potential for steroid reduction.
Aim To assess the impact of omalizumab therapy on maintenance steroid dose and acute corticosteroid courses.
Method A retrospective review was carried out of patients starting omalizumab after MDT approval. We investigated oral corticosteroid dose (OCS), asthma control, blood eosinophils, FEV1/FVC, FeNO, adherence to ICS and exacerbation frequency over the first 12 months of treatment. Data were non-normally distributed and reported as median (interquartile range), and between-group comparisons made using Mann-Whitney U test

Abstract P207 Table 1 Clinical outcomes over the first 12 months of omalizumab treatment. Significance level (p) in change *versus* baseline by Wilcoxon signed ranks test

	n	Baseline	n	12 mo	p
ACQ	67	3.16 (2.15–3.83)	46	2.16 (1.31–2.79)	<0.05
AQLQ	65	3.3 (2.46–4.66)	37	4.83 (3.66–5.7)	<0.05
FEV1% predicted	57	65 (52–81.5)	24	65.5 (56.75–77.5)	0.45
FeNO ppb	53	21 (13–36)	27	24 (13.5–40)	0.17
Blood eosinophils $x10^9$/L	66	0.24 (0.11–0.40)	25	0.2 (0.15–0.32)	0.62
Adherence% pickup	63	91 (76–100)	28	90.5 (77.5–100)	0.90

ACQ: asthma control questionnaire; AQLQ: asthma quality of life questionnaire; FeNO: fractional exhaled nitric oxide.

Results 71 patients were included (36 male). 25 patients were on a maintenance oral prednisolone dose at initiation of omalizumab [median (IQR) 10 (7.5–15) mg/d]). The dose reduced by 12 months of treatment (median (IQR) 7.5 (6.25–10) ($p<0.05$)). Patients had minimum four exacerbations in the year preceding omalizumab initiation; over the first year of treatment this reduced to median (IQR) 0 (1). There was also a significant improvement in ACQ and AQLQ scores (see table 1).
Conclusion The original trials for omalizumab focussed on improvement in lung functions and asthma control. The introduction of anti-IL5 MABs has switched the focus to reduction in steroid exposure. The results show that patients on maintenance steroids can achieve a reduction in steroid dose and exacerbations whilst on omalizumab. Alongside this they can improve their asthma control and quality of life. Monitoring of adherence to inhaled corticosteroids has shown ongoing compliance. We previously found a 50% non-compliance rate in our omalizumab patients. We feel this shows service improvements implemented have led to improved compliance to ICS.

REFERENCE

1. NICE TA28 Omalizumab for treating severe persistent allergic asthma. April 2018. https://www.nice.org.uk/guidance/ta278 <accessed 01/06/2021>

P208 DOES OBESITY AFFECT FRACTIONAL EXHALED NITRIC OXIDE INTERPRETATION IN DIFFICULT ASTHMA?

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Introduction Obesity-associated asthma is a difficult-to-treat phenotype linked with poorer disease control, reduced quality of life and increased morbidity and mortality. This phenotype coupled with type 2 (T2)-high inflammation may respond to currently available biologic treatments. Previous studies have

shown reduction in fractional exhaled nitric oxide (FeNO) with increasing body mass index (BMI) however, to our knowledge, no studies have shown this effect when adjusted for confounding variables such as corticosteroid use. We postulate that obesity has an impact on T2 biomarkers independent of confounders.

Methods Data from two recent studies (ID NCT03630432, NCT03858608) was analysed retrospectively, including patient demographics, medical and drug history, BMI, eosinophils, FeNO and atopic status; and most recently available total Immunoglobulin E (IgE) was collected for this analysis. The primary outcome of interest was the effect of BMI on T2 biomarkers: blood eosinophil count, FeNO and total IgE. Multiple linear regression was performed to investigate whether BMI could predict FeNO when adjusted for other variables (age, sex, atopic status, smoking status, allergic rhinitis, perennial rhinitis, and inhaled and oral corticosteroid dose). All statistical analysis was performed using IBM SPSS Statistics (version 27.0.1.0) and significance was set at <0.05.

Results The dataset included 102 overweight and obese difficult asthma participants, 26 overweight and obese mild asthma participants and 25 healthy-BMI mild asthma participants (n = 153). In multiple linear regression, BMI was a significant predictor of FeNO (β = -2.848, p = 0.019*); in this model, for every increase in BMI by 1 kg/m^2, FeNO decreased by 3 parts per billion (ppb) when adjusted for age, sex, atopy, smoking, rhinitis and corticosteroid dose. The overall model was significant, F(9,18) = 3.20, p =0.017*, with an R^2 = 0.62.

Conclusions Our data indicates there is a significant negative relationship between BMI and FeNO after adjusting for relevant variables, particularly corticosteroid use. This could have important implications for endotyping in this already hard-to-treat population, and affects subsequent assessment for advanced asthma therapies, such as biologics, that are tailored to T2-high endotypes. Limitations include non-equal weighting between groups and low numbers in this unpowered study.

P209 TREATABLE TRAITS IN DIAGNOSIS-NAÏVE AND UNTREATED PATIENTS WITH SUSPECTED ASTHMA – DATA FROM THE RADICA STUDY

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Background The identification of treatable traits (TT) has been proposed as a means to facilitate the delivery of precision medicine in severe asthma. We hypothesise that a similar approach may also provide novel insights in symptomatic patients during initial diagnosis, and aimed to evaluate the prevalence of TT in those with and without subsequently-confirmed asthma.

Method Symptomatic yet untreated patients with clinician-suspected asthma were recruited. Clinical history and examination were carried out before spirometry with bronchodilator reversibility (BDR), fractional exhaled nitric oxide, and bronchial challenges were performed. Blood eosinophils were measured and patients were skin prick tested. An asthma diagnosis was confirmed or refuted following 6–8 weeks of inhaled corticosteroids (ICS). Medication adherence was recorded using INhaler Compliance Assessment (INCA) device.

Results Of 81 adults (≥16 years), 12 were excluded as 'unclassifiable' due to borderline results or missing data. Of the remainder, 42 (45% male, mean [SD] 32.0 [12.3] yrs) were diagnosed with asthma and 27 (25% male, 37.1 [12.5] yrs) were not. Pulmonary, extrapulmonary and psychosocial TT

Abstract P209 Table 1 Summary of prevalence of treatable traits identified in symptomatic patients

Category	Treatable traits	Asthma	Non-asthma	p-value
Pulmonary	Airflow limitation	12/42 (28.6%)	0/27 (0%)	**0.006**
	Bronchodilator reversibility	19/42 (45.2%)	0/27 (0%)	**<0.001**
	High FeNO (≥40ppb)	23/42 (54.8%)	3/27 (11.1%)	**<0.001**
	Blood eosinophilia (≥0.4 x 10^9 cells/L)	14/40 (35.0%)	0/25 (0%)	**0.002**
	Exercise induced breathlessness	25/42 (59.5%)	17/27 (63.0%)	0.974
	Bronchial hyperresponsiveness to methacholine	19/33 (57.6%)	0/24 (0%)	**<0.001**
Extra pulmonary	Symptoms of rhinitis, n(%)	24/42 (57.1%)	18/27 (66.7%)	0.590
	History of nasal polyps n(%)	1/42 (2.4%)	0/27 (0%)	1.00
	Obesity (BMI>30)	14/42 (33.3%)	11/27 (40.7%)	0.713
	Symptoms of reflux	17/42 (40.5%)	21/27 (77.8%)	**0.005**
	Eczema	12/42 (28.6%)	3/27 (11.1%)	0.157
	Atopy$^{\infty}$	31/42 (73.8%)	15/27 (55.6%)	0.191
	Cat-sensitised	6/42 (14.3%)	5/27 (18.5%)	0.740
	Cat-sensitised and exposure	2/6 (33.3%)	1/5 (20%)	1.00
	Dog-sensitised	4/42 (9.5%)	0/27 (0%)	0.290
	Dog-sensitised and exposure	1/4 (25.0%)	0/0	n/a
	Self-reported food allergy	4/42 (9.5%)	4/27 (14.8%)	0.776
Psychosocial	Current smoker	9/42 (21.4%)	2/27 (7.7%)	**0.047**
	Former smoker	4/42 (9.5%)	8/27 (30.7%)	
	Non smoker	29/42 (69.0%)	16/27 (61.5%)	
	Self-reported anxiety/psychiatric disease	8/42 (19.0%)	9/27 (33.3%)	0.290
	Medication compliance rate*, Median (IQR)	78.9 (64.4–89.5)%	78.6 (67.0–87.0)%	0.149

Data presented as n (%), p-value calculated using chi-squared test or fisher's exact test. FeNO: fractional exhaled nitric oxide; $^{\infty}$ Skin prick test to eight common inhaled aeroallergens. *Data presented as median (IQR), p-value calculated using Mann-Whitney U test.

were identified in both asthma and non-asthma patients (table 1). Whilst airflow limitation, BDR, airway inflammation and bronchial hyperresponsiveness were more prevalent in asthma than non-asthma, exercise-induced symptoms were equally prevalent in both groups, as were extrapulmonary features such as obesity, rhinitis and atopy. There were more current smokers in asthma (21.4%) compared to non-asthma (7.7%, $p<0.05$), but psychosocial history and medication compliance during trial of ICS were similar in both groups. Reflux was the most prevalent TT identified in non-asthma (77.8%), found almost twice as commonly as in asthma (40.4%, $p=0.005$). Although atopy was the single most common feature in asthma (73.8%), the majority of non-asthmatics were also sensitised (55.6%). Four of 15 (26.7%, three with asthma) symptomatic and pet-sensitised patients had ongoing pet exposures.

Conclusion Treatable traits are common in patients with symptoms of asthma regardless of diagnostic labels, although the patterns of prominent features may be different, suggesting that personalised management strategy could be offered to symptomatic patients both with and without confirmed asthma. Future research should focus on further characterisation of TT in symptomatic patients with uncertain diagnosis.

Oxygen, CPAP, NIV or ICU: what works in COVID-19?

P210 NOT ALL COVID-19 DEATHS ARE HYPOXIC: OBSERVATIONAL COHORT STUDY OF PATIENTS WHO DIED AT THE NIGHTINGALE HOSPITAL EXETER

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The Nightingale Hospital Exeter (NHE) with 116 beds designed to deliver respiratory support including non-invasive ventilation and high flow nasal oxygen, managed 242 patients with Covid-19 from November 2020 to February 2021. Patients considered candidates for invasive ventilation were not transferred to NHE. In those who died there were two observed modes of death: those that were hypoxic and patients that died without any significant hypoxia Hypoxic respiratory failure is well-documented as a cause of death in Covid-19 but the mechanism of death in non-hypoxic patients remains incompletely understood.

Methods Electronic patient records were retrospectively reviewed for all deaths at the NHE between 26.11.2020 and 24.02.2021. Data collection included patient characteristics, pre-morbid function and pre-existing respiratory and neurological comorbidities, cause of death at certification, oxygen saturations, Fi02 and level of respiratory support both on admission, last recorded prior to death and the maximum required during admission. Hypoxia was considered significant if the last recorded oxygen saturations prior to death or palliation were < 88% irrespective of Fi02 or if the patient was receiving > 30% inspired oxygen.

Results A total of 242 patients from eight NHS Trusts were admitted to the NHE, and 37 (15%) died. Of the patients that died, 32% had no significant hypoxia. Table 1 compares the two groups. Five patients were treated with high flow nasal oxygen, all of whom died hypoxic. In non-hypoxic patients with an alternative cause of death these were either pneumonia, sepsis or dementia.

Abstract P210 Table 1 Patient demographics of Covid related deaths with and without hypoxia

	Hypoxic	Non-hypoxic
Age (years)	84	89
Days from positive swab to death (days)	12	19
Pre-existing respiratory disease (total (%))	5 (40%)	10 (42%)
Pre-existing neurological condition (total (%))	13 (52%)	7 (58%)
Death attributed to Covid-19 (total (%))	22 (88%)	6 (50%)

Discussion Atypical presentations of Covid-19 in the elderly are well-documented. We observed a population of patients who died after testing positive for Covid-19 who were not hypoxic, but had no other cause of death other than Covid-19 identified. Neither underlying respiratory disease nor underlying neurological conditions predicted mode of death although there was a trend towards a hypoxic death in younger patients. Few studies have looked at underlying cause of death from Covid-19 beyond its hypoxic and cardiovascular effects and further research is needed to understand the additional modes of death caused by this virus.

P211 COMPARING OUTCOMES AND CHARACTERISTICS OF COVID-19 PATIENTS TREATED WITH CPAP INSIDE AND OUTSIDE OF THE INTENSIVE CARE UNIT

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10.1136/thorax-2021-BTSabstracts.320

Introduction and Objectives Continuous Positive Airway Pressure (CPAP) has been widely adopted to manage hypoxaemic respiratory failure secondary to COVID-19 pneumonia. Currently promising data is available to suggest the success this as a definitive treatment for such patients, both inside and outside of the ICU. We aim to compare the outcomes and characteristics of patients treated with CPAP in these two settings.

Methods In this single-centre prospective observational study we observed the baseline characteristics, physiological observations, laboratory tests, and outcomes of all consecutive patients with COVID-19 pneumonia between April 2020 and March 2021 treated with CPAP. We report data from patients treated in both the ICU and the designated COVID-19 Respiratory Support Unit.

Results We report the outcomes of 187 patients (Mean Age = 66.1[SD=12.7], 64% Male [n=120]) with COVID-19 pneumonia treated with CPAP in a single NHS trust. Overall mortality for these patients was 45% (n=84), this was significantly higher for the patients treated outside of the ICU (29% vs 60%, $p<0.001$). Those who received CPAP in the ICU were significantly younger than those treated outside of this setting (Mean Age (SD) = 61.2 (13.9) vs. 70.9 (11.8), $p<0.001$). The group of patients treated outside of

the ICU were found to be significantly more comorbid, having significantly higher proportions of hypertension (41% vs 59%, p=0.005), diabetes mellitus (18% vs 38%, p<0.001), COPD (13% vs 28%, p=0.008), asthma (8% vs 18%, p=0.031), ischaemic heart disease (11% vs 27%, p=0.003), and a history of smoking (33% vs 59%, p<0.001). We do not report any differences in the duration of treatment with CPAP.

Conclusions In our report we found that inpatient mortality of those treated inside of the ICU was significantly lower than that of those treated outside of this setting, however, those treated in the ICU were also significantly younger and had fewer comorbidities. Despite the higher mortality outside of the ICU, 40% of patients treated in this setting survived to discharge, this may suggest that those who may be deemed unsuitable for treatment with CPAP on the ICU can be managed safely outside of this setting.

Abstract P211 Table 1 Displaying baseline characteristics, physiological observations, laboratory tests, and outcomes of all patients treated with CPAP and comparing these observations between those treated inside and outside of the ICU

	All Patients (n=187)	ICU (n=90)	Non-ICU (n=97)	p-value
Age - Mean (SD)	66.1 (12.7)	61.2 (13.9)	70.9 (11.8)	<0.001
Male – n (%)	120 (64)	57 (63)	63 (65)	0.530
CPAP duration in days – Median (range)	4 (1–48)	4 (1–20)	4 (1–48)	0.356
Inpatient Death – n (%)	84 (45)	26 (29)	58 (60)	<0.001
Comorbidities - n (%)				
HTN	94 (50)	37 (41)	57 (59)	0.005
Diabetes Mellitus	53 (28)	16 (18)	37 (38)	<0.001
COPD	39 (21)	12 (13)	27 (28)	0.008
Asthma	24 (13)	7 (8)	17 (18)	0.031
IHD	36 (19)	10 (11)	26 (27)	0.003
Smoking History	87 (47)	30 (33)	57 (59)	<0.001
Obesity	69 (37)	36 (40)	33 (34)	0.108
Laboratory Results - Mean (SD)				
Admission WCC - $x10^9$/L	9.8 (4.4)	11.0 (6.3)	8.8 (4.2)	0.016
Admission lymphocyte count - $x10^9$/L	1.25 (0.64)	1.94 (0.81)	1.18 (0.95)	0.190
Admission Urea - mmol/L	9.3 (6.7)	7.8 (4.2)	10.6 (7.8)	0.006
Admission C-reactive Protein - mg/L	135.8 (101.5)	135.2 (102.0)	130.1 (90.8)	0.750
Observations pre-CPAP – Mean (SD)				
Respiratory Rate	25.8 (6.4)	26.4 (6.9)	25.7 (6.0)	0.345
Heart Rate	92.4 (20.4)	96.9 (21.7)	89.8 (19.7)	0.044
Oxygen Saturations	88.8 (7.1)	88.7 (7.3)	88.4 (6.7)	0.280
FiO2 -%	59.9 (22.9)	58.9 (32.3)	66.1 (17.5)	0.074
Arterial Blood Gas Results pre-CPAP – Mean (SD)				
Arterial pH	7.44 (0.08)	7.45 (0.07)	7.44 (0.07)	0.484
Arterial pO2 - kPa	7.4 (1.4)	7.4 (1.3)	7.4 (1.5)	0.796
Arterial Base Excess – mmol/L	0.6 (4.9)	0.7 (3.6)	0.5 (5.0)	0.813

P212 NON-INVASIVE RESPIRATORY SUPPORT IN ADULTS WITH COVID-19 WHO ARE NOT FOR INTUBATION: THE BALANCE BETWEEN SAVING LIVES AND PROLONGING DEATH

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Introduction Non-invasive respiratory support (NIRS) has been used in adults with COVID-19 who are not for intubation (DNI), but mortality in this group was as high as 89% in the first wave (1). To our knowledge, there is no data on outcomes after advances such as steroids, and on factors associated with effective NIRS in this group.

Methods We retrospectively collected data on all adults with COVID-19 who were treated with NIRS between 17/9/2020 and 30/1/2021 during the 'second wave' in our hospital. Logistic regression was used to review the multi-variate association between mortality and investigated factors.

Results In our respiratory wards, 309 adults received NIRS, of whom 106 had a DNI.

Adults with a DNI were older and more multi-morbid (see Table 1). Mortality in adults with a DNI compared to those without was significantly higher (74.5% *vs.* 26.2%, p-value<0.001; odds ratio (OR) 8.20, 95% confidence interval (CI) 4.78–14.21), even after adjusting for age and comorbidities (OR 3.03, 95% CI 1.35–6.81).

There were few factors which predicted effective NIRS in this group (see table 1). 92.1% of 38 adults who received sedatives to improve tolerance died.

Discussion Even allowing for age and multi-morbidity and despite advances in treating COVID-19, mortality remains high at 74.5% for adults with a DNI who require NIRS.

There is little guidance on using NIRS in this group, with one large clinical trial excluding adults with a DNI (2). NIRS has disadvantages; it may present a significant treatment burden and patients who required sedation to aid compliance had higher mortality. Furthermore, there are few factors to guide which patients benefit. There are thus ethical implications to offering NIRS, especially in resource-strained settings.

More research is urgently required in this group, especially for future waves. Meanwhile, clinicians should sensitively discuss the risks of treatment failure and involve palliative care to help manage distressing symptoms such as breathlessness and anxiety.

REFERENCES

1. Vaschetto R, et al. Outcomes of COVID-19 patients treated with continuous positive airway pressure outside the intensive care unit. *ERJ Open Res* 2021. doi:10.1183/23120541.00541-2020
2. RECOVERY-RS Respiratory support: respiratory strategies in COVID-19 trial protocol.

Abstract P212 Table 1 Demographic, co-morbidities, treatment and outcome data

Data for all patients treated with CPAP/HFNO on respiratory wards for COVID-19			
	Adults for intubation (n=203)	**Adults not for intubation (DNI) (n=106)**	**p-value**
	Demographics and co-morbidities		
Age*	60.3 (± 12.6)	76.3 (± 11.4)	**<0.001**
Male sex (%)	68.8	57.5	0.049
Black, Asian & Minority Ethnic (%)	61.1	48.1	**0.029**
Body mass index*	29.8 (± 5.7)	29.7 (± 9.7)	0.95
Diabetes (%)	30.2	41.5	0.047
Cardiovascular disease (%)	49.5	69.8	**<0.001**
Chronic respiratory disease (%)	20.3	40.6	**<0.001**
Mental health disease (%)	7.9	18.9	**0.04**
Smoking history (%)	34.0	41.9	0.277
Charlson co-morbidity index	3 (2–5)	3 (2–5)	0.956
Clinical frailty score	3 (2–4)	5 (4–6)	**<0.001**
	Admission data and outcomes		
Day of COVID-19 symptoms on admission to respiratory ward	9 (7–12)	8 (5.5–12)	0.119
Treated with dexamethasone (%)	99.5	97.2	0.085
Treated with remdesivir (%)	37.1	29.5	0.184
Treated with tocilizumab (%)	10.4	4.7	0.089
Died (%)	25.6	74.5	**<0.001**
Factors associated with mortality in adults with DNI treated with CPAP/HFNO			
	Odds ratio	**95% lower confidence interval**	**95% upper confidence interval**
Age	1.04	1.00	1.09
Male sex	2.51	1.03	6.13
Black, Asian & Minority Ethnic	1.00	0.41	2.40
Body mass index	0.99	0.95	1.04
Diabetes	1.28	0.52	3.16
Cardiovascular disease	0.76	0.28	2.02
Chronic respiratory disease	0.99	0.41	2.41
Mental health disease	0.75	0.26	2.21
Smoking history	1.40	0.41	4.80
Charlson co-morbidity index	1.02	0.85	1.22
Clinical frailty score	1.06	0.73	1.54
Treated with remdesivir	0.73	0.28	1.88
Treated with tocilizumab	1.39	0.15	12.98
Given sedatives	4.35	1.37	13.82

*Presented as mean with standard deviation. Non-parametric data presented as median with IQR.

P213 FACTORS INFLUENCING OUTCOME IN COVID-19 PATIENTS REQUIRING RESPIRATORY SUPPORT – A SINGLE CENTRE EXPERIENCE FROM WEST MIDLANDS

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Introduction Respiratory failure in COVID pneumonia is often associated with ARDS. Invasive mechanical ventilation (IMV) is associated with high mortality and prolonged hospital stay. Continuous positive airways pressure (CPAP) has emerged as a bridge to IMV or as ceiling of care in patients with high clinical frailty scale (CFS).

Methods We retrospectively analysed data of patients admitted our respiratory support unit (RSU) between September 2020 till January 2021. Patients admitted to our RSU received CPAP, High flow nasal oxygen(HFNO) and non invasive ventilation (NIV).

Results 118 patients were included in the analysis. Mean age was 71 years with 61% (n = 72) comprising of male patients. 77 patients (65%) patients receiving respiratory support (RS) died. 80(67%) patients had more 2 or more co morbidities. 60%(n=71) and 20.3% (n =24) received CPAP and HFNO as predominant modality respectively. Mean CFS was 4.3 in survival group as compared to 4.7 in survival group (p 1.98).88% patients (n=67) who died were aged above 65. Average time on RS was 7.5 days and length of stay (LOS) was 12.5 days. RS compliance was higher in survival group 85%(n=35) as compared to deceased group 42%(n=32). Time on RS in survival and deceased group were comparable 7.2 days and 8.4 days respectively (p 1.98). Time from positive PCR test to start of RS was lower in survival group (2.9 days vs 2 days, p 0.18). Mean D Dimers were 1.7 in survival group as compared to deceased group 3.5 (p 0.18). Use of syringe driver was high in deceased group (66% n=51) as compared to survival group (n=2). Mean BMI was higher in survival group (33.9 vs 28.7, p 0.001)

Abstract P213 Table 1

	CPAP survived	**CPAP Deceased**	**P value**
Age	62	77	**0.000004***
BMI	33	28.7	**0.001***
CFS	4.3	4.7	1.98
CRP	89	136	**0.004***
D Dimer	1.7	3.6	0.18
Troponin	325	125	0.19
Time to start RS (days)	2	2.9	0.10
Length of stay(days)	13.4	12.1	0.42
Days on RS (days)	8.4	7.2	1.98

*p < 0.05 = statistically significant

Discussion Age, high CFS, and poor compliance with CPAP is associated with higher mortality in COVID 19 related ARDS. Further studies are needed to assess impact of troponin and D Dimer on COVID related ARDS outcomes.

P214 COVID-19 MORTALITY RATES IN A DISTRICT GENERAL RESPIRATORY SUPPORT UNIT

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Introduction The use of non-invasive respiratory support for COVID-19 related respiratory failure outside of Intensive Care Units (ICU), delivered in respiratory support units, became widespread during the COVID-19 pandemic. There is paucity of data thus far for outcomes in this patient cohort.

Methods We retrospectively reviewed the medical notes of 89 patients with COVID-19 pneumonitis admitted to our recently opened (April 2020) Respiratory Support Unit (RSU) at Colchester General Hospital from 17th April, 2020 to 13th February, 2021. Mean age was 69 years (range 30 – 93 years) and 56 patients were male. Sixty three patients received continuous positive airway pressure (CPAP), 6 patients received high flow nasal oxygen (HFNO), 13 patients received a combination of CPAP with periods of HFNO and 7 patients received non-invasive ventilation (NIV).

Results On admission to the RSU, patients had average saturations of 87.5% (range 50 – 99%) with an average pO2 of 7.69kPa (range 3.6 – 18). The majority of patients were receiving fraction of inspired oxygen (FiO2) greater than 0.6. RSU success (wean from CPAP/NIV/HFNO) was 24.7%. RSU failure (either escalation to ICU or death, depending on treatment-escalation status) was 75.3%. The overall mortality rate was 71.9%. Mortality was higher (80%) in those patients who were not for escalation to ICU. Mortality in those for full treatment escalation was 42.1%. Higher mortality occurred in patients with multiple comorbidities, increasing age and higher Rookwood Clinical frailty scores (CFS). Patients without any additional organ dysfunction had lower mortality (62.5% vs 87.9%). Increasing mortality was observed with increasing time from hospital arrival to RSU admission. All patients aged 80 years or above and those with a CFS 6 died. Complications included pulmonary embolism (n=3), pneumothorax (n=1) and pneumomediastinum (n=1).

Abstract P214 Table 1

Mortality by groups

Age groups	**30–39**	**40–49**	**50–59**	**60–69**	**70–79**	**≥80**
Mortality (%)	0	40	50	71.4	79.5	100
CFS	**1**	**2**	**3**	**4**	**5**	**6**
Mortality (%)	20	43	79	77.3	87.5	100
Number of comorbidities	**0**	**1**	**2**	**3**	**4**	
Mortality (%)	42.9	46.1	76.9	80	84.6	
Time to admission to RSU (days)	**Less than 1**	**1-2**	**3-7**	**8 or more**		
Mortality (%)	63.2	64.7	81.5	81.8		

Conclusion These data demonstrate the high mortality in patients with respiratory failure secondary to COVID-19 pneumonitis admitted to our RSU, particularly in those who were not for escalation to ICU. Increasing age, number of comorbidities and CFS were associated with treatment failure as well as time between presentation and admission to RSU. Careful patient selection with consideration of these factors is vital when identifying patients appropriate for respiratory support.

P215 A RETROSPECTIVE OBSERVATIONAL STUDY OF COVID-19 PATIENTS ON A RESPIRATORY HIGH CARE UNIT (RHCU)

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During the COVID-19 pandemic, our district general hospital serving a population of 200,000, transformed a medical ward into a Respiratory High Care Unit (RHCU) – managing COVID positive and negative patients. Our primary mode of oxygenation was continuous positive-airway pressure (CPAP).

Between 1st June 2020 and 31st March 2021, 359 patients were admitted to RHCU. We performed a retrospective observational study assessing COVID-positive aerosol generating procedure (AGP) patients. 156 patients (43%) fit this criteria, 144 notes were available for analysis.

96% of patients were admitted on ≥40% FiO2. 23% of patients were admitted from Accident and Emergency.

Abstract P215 Table 1

RHCU data	**COVID-19 AGP (n = 144)**
Gender – male (%)	72
Age (mean years)	66.2
White ethnicity (%)	94
Current or ex-smoker (%)	45
CFS of admissions (%)	
- 1–2	52
- 3–4	36
- ≥5	12
FiO2 ≥40% prior to admission to RHCU (%)	96
Days from hospital admission to AGP (no. of patients)	
- 1–3	62.5
- 4–7	27.8
- ≥8	9.7
Average pO2 prior to AGP (kPa)	8.26
Survival based on CFS (%)	
- 1	87
- 2	55
- 3	26
- 4	10
Patients for escalation to ICU (% total)	50
- Patients admitted to ICU (% total)	20
ICU outcome (% mortality)	52
Novel treatment (% of those eligible):	
- Dexamethasone	100
- Correct anticoagulation	95
- Tocilizumab	87
- Remdesivir	61
RECOVERY trial recruitment (%)	29
Duration of hospitalisation (days)	16.6
Average time on AGP (days)	6.2
RHCU outcomes (%)	
- Discharged	19
- Transferred to another ward	22
- Transferred to ICU	20
- Died	39
Overall RHCU end hospital outcome (% mortality)	52

Mean age was 66.2, 72% male. 94% white, in keeping with our population. Most common comorbidities included pre-existing lung disease (35%), cardiovascular disease (33%) and diabetes (29%). 52% had Rockwood clinical frailty score (CFS) 1–2.

50% were for full escalation. In total, 20% were transferred to Intensive Care Unit (ICU). Of those, average time from initiating AGP to ICU admission was 4 days. Patients transferred within 24 hours of initiating AGP and subsequently intubated, had a 40% mortality rate, versus 75% if transferred > 5 days after AGP initiation. Overall ICU mortality rate was 52%.

Average inpatient length was 16.6 days, mean AGP duration was 6.2 days. Patients with CFS 1 had a 13% mortality following AGP initiation, versus 90% mortality in those with CFS 4. We also noted a 1.1kPa PO2 difference prior to AGP initiation for the survivors (8.8kPa vs 7.7kPa).

Overall RHCU outcome: 19% discharged, 39% died, 22% transferred to other ward (87% survived), 20% ITU (48% survived). ReSPECT form was completed in 87% and End of Life care-plan initiated in 81% who died.

Despite challenges, including staff shortage, low morale, oxygen and beds limitation, we remained up-to-date throughout the pandemic offering novel treatments. Of those eligible, 100% received dexamethasone, 95% were appropriately anticoagulated, 87% were given tocilizumab and 61% received remdesivir. 29% of patients were recruited into the RECOVERY trial, far exceeding recruitment within the trust (11.2%), regionally within the West Midlands (6.3%), and nationally (10%).[1]

REFERENCE

1. National Institute for Health Research. *Recruitment progress report.* RECOVERY. CPMS 45388, 02/3/2021.

P216 COVID-19 AND ETHNICITY: HOW DOES IT IMPACT ADMISSION TO INTENSIVE CARE AND USE OF CPAP?

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Background In the first wave of the COVID-19 pandemic, published data suggested that patients from ethnic minority backgrounds were disproportionately affected by the disease; however, there appears to be a paucity of data regarding specific outcomes such as admission to intensive care (ICU) and use of continuous positive pressure (CPAP) ventilation.[1] We describe a patient cohort presenting to two urban district general hospitals, analysing whether ethnicity is associated with increased morbidity.

Methods A retrospective cohort analysis of 752 patients with a clinical or laboratory (RT-PCR positive) diagnosis of COVID-19 presenting to the respiratory units across two hospitals was conducted. Data was collected on patients' self-reported ethnic identity, admission to ICU, use of CPAP and intubation.

Results 48 patients' ethnic identities were unavailable and therefore excluded from analysis. Of the 704 patients included in analysis, median age was 61, 58.1% male and 41.9% female. Within this cohort, non-white patients (n=259) were more likely to require ICU admission and intubation when compared with white patients (n=445) (RR 1.75 [p <0.0015], RR 2.092 [p <0.0063]). Subgroup analysis showed, black patients (n=47) were more likely to require ICU admission (RR 2.322 [p < 0.0184]), intubation (RR 3.293 [p <0.0017]) and CPAP (RR 1.612 [p <0.00183]) when directly compared to white patients. Patients of South Asian (n=127) origin were more likely to require intubation (RR 1.98 [p <0.0396]) but no significant difference was noted in use of CPAP.

Conclusion Existing evidence suggests that patients from ethnic minority backgrounds were disproportionately affected by acute COVID-19 and are more likely to be exposed. Our analysis demonstrates that this patient group often experienced more severe disease requiring ICU admission and respiratory support, compared to white patients. Current hypotheses include a higher prevalence of comorbidities, socioeconomic factors and societal structural inequalities. Our study not only adds to current data and underlines the importance of continued research into this area, but also helps clinicians, particularly those within hospitals serving diverse populations, prepare resources for further potential surges of COVID-19.

REFERENCE

1. Sze S, et al. Ethnicity and clinical outcomes in COVID-19: a systematic Review and Meta-analysis. *EClinicalMedicine* 2020;100630.

P217 IMPROVED COVID-19 OUTCOMES IN A LARGE NON-INVASIVE RESPIRATORY SUPPORT COHORT DESPITE NEW VARIANTS

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Background Respiratory high-dependency units (rHDU) are widely used to manage respiratory failure in coronavirus-19 (COVID-19) outside of the intensive care unit (ICU). Wave two variants of COVID-19 have been linked to increased rates of mortality and admission to ICU, however, their impact on a rHDU population, as well as the effects of new treatments, have not been previously studied.[1] In this study we aimed to compare our clinical practice and rHDU outcomes between the two main UK waves of COVID-19 infection and identify factors that influenced outcomes in the second wave.

Method We conducted a single-centre, retrospective analysis of all patients with a diagnosis of COVID-19 admitted to the rHDU of our teaching hospital for respiratory support during the first wave from 23rd March to the 4th June 2020 and the second wave in between 10th October 2020 and 31st January 2021 when our evaluation ended. Patient data including virus genotype, treatments received and patient outcomes were collected and compared between waves.

Results In total, 348 patients were admitted to rHDU; 71 (20.4%) during the first wave and 277 (79.6%) in the second wave. Patient characteristics are shown in *table 1*. Mortality and intubation rates were lower in the second wave compared with the first. Patients in the second wave were less frail and more patients in the second wave received CPAP as their primary respiratory support and were able to prone. The VOC B.1.1.7 variant did not have a significant effect on rHDU outcome.

Abstract P217 Table 1 A comparison of first and second wave characteristics, treatment and outcome data

	First wave	Second wave	Mean difference (95%CI)	X^2 (df)	P value
Age (years)	69.0 (52.0, 80.0)	62.0 (52.0, 71.0)	-3.4 (-7.8 to +1.1)	-	0.14
Sex:					
- Male	49 (69.0%)	180 (65.0%)	-	0.4 (1)	0.52
- Female	22 (31.0%)	97 (35.0%)			
BMI (kg/m^2)	28.5 (24.9, 33.6)	29.6 (24.8, 34.9)	+0.6 (-1.7 to +2.9)	-	0.63
Clinical Frailty Score:				15.6 (5)	
- 1 to 2 (fit)	18 (25.4%)	132 (47.7%)	-		0.008
CT severity score					
- Moderate/severe	11 (29.7%)	131 (52.2%)	-	16.0 (3)	0.0012
- Severe	23 (62.2%)	113 (45.0%)			
CRP prior to rHDU admission (mg/L)	180.6 (118.0, 210.0)	124.1 (78.1, 175.6)	-44.1 (-66.9 to -21.3)	-	0.0002
Spike gene testing					
- VOC B.1.1.7 variant	-	143 (67.1%)	-	-	-
- Wild-type	-	57 (26.8%)			
- Ambiguous	-	13 (6.1%)			
Dexamethasone	3 (4.2%)	266 (96.0%)	-	271.4 (1)	<0.0001
Remdesivir	4 (5.6%)	198 (71.5%)	-	100.6 (1)	<0.0001
CPAP as primary respiratory support	32 (45.1%)	248 (89.5%)	-	71.1 (1)	<0.0001
Able to adopt semi- or full- prone position	42 (59.2%)	237 (85.6%)	-	24.8 (1)	<0.0001
Admission outcome (all)				14.7 (1)	0.0001
- Died	36 (50.7%)	74 (26.7%)	-		
- Discharged	35 (49.3%)	201 (72.5%)			
rHDU outcome ('For Intubation')				17.3 (2)	0.0002
- Died	0 (0.0%)	7 (3.3%)	-		
- Off respiratory support	14 (41.2%)	152 (72.4%)			
- Intubated	20 (58.8%)	51 (24.3%)			

Conclusion Our single centre experience shows that rHDU mortality and intubation rates have improved over time in spite of the emergence of new variants. Improvements in outcome are likely to be multi-factorial. Our data support the benefit of pharmacological COVID-19 therapies in a rHDU population as well as the use of CPAP and awake proning. Other potential causes for improved outcomes are lower serological and radiological COVID-19 severity in our wave two cohort as well as reduced rates of frailty.

REFERENCE

1. https://medrxiv.org/content/10.1101/2021.03.11.21253364v1

P218 A TALE OF TWO WAVES: A SINGLE CENTRE RETROSPECTIVE COHORT STUDY ASSESSING MORTALITY IN SEVERE COVID-19 IN FIRST AND SECOND WAVES

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10.1136/thorax-2021-BTSabstracts.327

Introduction and Objectives The first and second waves of COVID-19 showed different mortality patterns in hospitalized patients (Iftimi S, et al, PLos One 2021; 16(3)) but it is less clear if that holds true for severe COVID-19 patients who required respiratory support. The rationale of this study is to assess mortality difference of severe COVID-19 patients from both waves who required respiratory support.

Methods A retrospective review was conducted of all patients with severe COVID-19 requiring respiratory support including CPAP/High Flow Nasal Cannula (HFNC) admitted to a respiratory support unit at a London District Hospital in first wave (March-May 2020) and second wave (November 2020-March 2021). Mortality was assessed for CPAP/HFNC and intubation groups of each wave in accordance with age and clinical frailty score (CFS) as baseline characteristics.

Results In wave one, 89 patients were treated with CPAP/HFNC. 53 patients (60%) were offered CPAP/HFNC alone whilst 36 (40%) patients escalated to mechanical ventilation. In CPAP/HFNC group, 35 (66%) survived (Median age: 69, Median CFS: 2), and 18 (34%) died (Median age: 69, Median CFS: 2). In intubated group, 17 (47%) survived (Median age: 61, Median CFS: 2) and 19 (52%) died (Median age: 61, Median CFS: 2). Total 37 patients died with overall mortality 41%.

In wave two, 207 patients were treated with CPAP/HFNC. Of these, 150 (73%) were offered CPAP/HFNC alone whilst 57 (27%) were escalated to mechanical ventilation. In CPAP/HFNC group, 104 (69%) survived (Median age: 66, Median CFS: 2) and 46 (31%) died (Median age: 67, Median CFS: 2). In intubated group, 33 (58%) survived (Median age 62, Median CFS: 2) and 24 (42%) died (Median age: 62, Median CFS: 2). 70 patients died in total with overall mortality 34%.

Conclusion Our findings suggest overall mortality improved in second wave in severe COVID-19 patients though baseline characteristics were not significantly different. This is likely to reflect lessons relating to patient care from wave one and increasing use of steroids and IL-6 inhibitors.

P219 CHALLENGES WITH END-OF-LIFE CARE IN COVID PATIENTS REQUIRING NON-INVASIVE RESPIRATORY SUPPORT

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Introduction The COVID-19 pandemic has seen an unprecedented number of adults receiving non-invasive respiratory support (NIRS) with such patients having a high mortality rate.

Methods As part of better elucidating the challenges of end of life care delivery in the COVID era, we conducted an audit of our respiratory HDU ward at Whipps Cross Hospital focusing on a 19-week period between 17/09/2020–30/01/2021 and on patients who did not survive their admission. We excluded patients that were transferred to ITU.

Results Of a total of 309 patients receiving NIRS on our ward, 84 died during that time at a mean age of 77 (95% CI 67–87) and median of 79 years. 63 patients received CPAP, 67 received HFNT and 42 were first started on HFNT and converted to CPAP. The average length of stay was 10 days (4–16). The mean day of symptoms on presentation to hospital was 11.5 days (1.7–21.3). Average duration of symptoms prior to admission to our ward was 19.7 (9.1–30.3) days.

One death was unexpected and followed a cardiac arrest. The most common indicator for a patient approaching end-of-life was hypoxia on NIRS, which was documented in 36 (43%) patients, followed by terminal agitation in 27 (32%) patients. The average time between recognising end-of-life and death was 1.4 days with a median of 2 days. 72 (86%) patients were weaned off NIRS and those who continued did so due to a medical or patient decision. Despite the vast majority (82% of patients) being on syringe drivers with an opiate and benzodiazepine most patients had persistent terminal symptoms: 51 (74%) had agitation and 38 (55%) were persistently breathlessness. Interestingly, no patient opted to rest in the prone position.

Discussion This data primarily suggests the challenging nature of managing end-of-life care for COVID patients deteriorating on NIRS due to the high symptom load and the short time there is to achieve comfort for these individuals. Clinicians need to conduct frequent comfort reviews for such patients, consider subcutaneous infusions, as well as potentially an increase in medication doses, in conjunction with specialist palliative care input, in order to achieve comfort.

P220 ASSESSING THE MULTI-DISCIPLINARY TEAM RESPONSE TO NIV WITHDRAWAL GUIDELINES IN PATIENTS WITH COVID-19

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Introduction Withdrawal of NIV in COVID-19 patients at end of life presents several challenges. Patients are often more alert and have a higher symptom burden than in other end of life situations where NIV is withdrawn. The NIV withdrawal guideline, created by the centre, was updated to reflect the requirement for higher doses of anticipatory medications required for some patients in this cohort after learning from the first wave of COVID-19. The aim of this study was to review staff response to the guideline and its efficacy.

Method A questionnaire was sent to physician associates, nursing staff and doctors of all grades who have worked on the Respiratory Support Unit during the COVID-19 pandemic. This collected several types of data on staff perception of NIV withdrawal in COVID-19 patients.

Results The questionnaire generated 39 responses from the multidisciplinary team (MDT).

97% of respondents found the withdrawal of NIV in COVID-19 challenging, and 74% felt this was more difficult in patients with COVID-19 than with other pathologies. 87% were aware of the Trust guideline regarding NIV withdrawal and 82% used it in their practice. All respondents felt the guideline was useful. While the majority of healthcare workers felt that adequate symptom control was achieved, 20% of respondents did not. This unease was further evidenced as 64% of respondents had issues or concerns regarding the use of anticipatory medications. The predominant concerns were that medication doses were started too low (35%) or too late (46%). 71% of respondents found discussions with families regarding commencing palliation challenging. All members of the multidisciplinary team found an MDT approach, including the involvement of Palliative Care colleagues, a useful source of support. The team was united in finding debriefs useful.

Conclusions Overall, this study identified that timing and dosage of anticipatory medications are a particular challenge in withdrawal of NIV in patients with COVID-19. There is scope for additional learning regarding symptom management during withdrawal of NIV. Maintaining a close relationship with the Palliative Care team provides benefit to patients, their families and staff. Further work will also focus on supporting staff in difficult conversations.

Declarations of interest

T4 REINFECTION WITH INFLUENZA A VIRUS LEADS TO RAPID CHANGES IN IMMUNOMODULATORY MOLECULES AND INFLAMMATORY SUBTYPES OF LUNG FIBROBLASTS AND EPITHELIAL CELLS

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S2 DERIVATION OF A PROTOTYPE ASTHMA ATTACK RISK SCALE CENTRED ON BLOOD EOSINOPHILS AND EXHALED NITRIC OXIDE

This work was supported by the Oxford Respiratory NIHR BRC. The views expressed are those of the authors and not necessarily those of the NHS, the NIHR or the Department of Health. This research was funded in part by the Wellcome Trust (211050/Z/18/Z). One of the co-authors (A Laugerud) is an employee of Sanofi Norway.

S3 EMERGENCY ROOM VISITS AND RESCUE MEDICATION USE IN PATIENTS WITH ASTHMA IN THE IRIDIUM STUDY AND THEIR IMPACT ON CARBON FOOTPRINT

The study was funded by Novartis Pharmaceuticals, East Hanover

S7 ESTIMATING THE POTENTIAL IMPACT OF RESIDUAL EDS ON THE QOL OF PATIENTS WITH OSA AND, FOR THE FIRST TIME, THEIR PARTNERS, USING A TIME TRADE-OFF METHODOLOGY

K Tolley, J Noble-Longster, R Hibbs, L Stainer, and M Cawson are employees of Tolley Health Economics, Buxton, UK, who received funding from Jazz Pharmaceuticals to complete this work.

S Mettam is an employee of Jazz Pharmaceuticals who, in the course of his employment, has received stock options exercisable for, and other stock awards of, ordinary shares of Jazz Pharmaceuticals plc.

A Manuel is an employee of Liverpool University Hospital NHS Foundation Trust, UK, who has received consulting fees from Jazz Pharmaceuticals.

S17 DYNAMIC EARLY WARNING SCORE VERSUS NATIONAL EARLY WARNING SCORE-2 FOR PREDICTING CLINICAL DETERIORATION IN RESPIRATORY PATIENTS

S Gonem is funded by a Medical Research Council Clinical Academic Research Partnership. S Forster is funded by a William Colacicchi Fellowship.

S26 EFFECT OF SINGLE-INHALER EXTRAFINE BECLOMETASONE/FORMOTEROL/GLYCOPYRRONIUM PMDI (BDP/FF/GB) COMPARED WITH TWO-INHALER FLUTICASONE FUROATE/VILANTEROL DPI + TIOTROPIUM DPI (FLF/VIL+TIO) TRIPLE THERAPY ON HEALTH-RELATED QUALITY OF LIFE (HRQOL) IN PATIENTS WITH COPD: THE TRISTAR STUDY.

The trial was sponsored by Chiesi Farmaceutici. M Kots, G Georges and A Guasconi are full-time Chiesi employees.

S32 COMBINATION FIXED-DOSE BETA AGONIST AND STEROID INHALER AS REQUIRED FOR ADULTS OR CHILDREN WITH MILD ASTHMA: A COCHRANE SYSTEMATIC REVIEW

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S37 DUAL STEP INTERFERON-GAMMA RELEASE ASSAY TESTING CAN IMPROVE TUBERCULOSIS (TB) RISK STRATIFICATION IN CONTACTS OF PULMONARY TB: A PROSPECTIVE ADULT HOUSEHOLD CONTACT COHORT STUDY

JWK was funded by Wellcome. AOG was funded by Francis Crick Institute.

S38 EVALUATION OF MYCOBACTERIUM TUBERCULOSIS-SPECIFIC IFN-G, TNF-A, CXCL10, IL2, CCL2, CCL7 AND CCL4 LEVELS FOR ACTIVE TUBERCULOSIS DIAGNOSIS

This work was supported by the National Institute for Health Research Efficacy, Mechanisms and Evaluation Programme, Grant #12/65/27 (Validation of New Technologies for Diagnostic Evaluation of Tuberculosis (VANTDET)). A Lalvani is a United Kingdom National Institute for Health Research (NIHR) Senior Investigators Emeritus. A Fries is an NIHR Academic Clinical Fellow. Conflict of interest statement A Lalvani reports issued patents underpinning IGRA and next-generation IGRA some of which were assigned by the University of

Oxford to Oxford Immunotec plc resulting in royalty entitlements for the University of Oxford and A Lalvani. A Lalvani is also inventor of issued and pending unlicensed patents underpinning flow-cytometric diagnosis of TB. No other authors report a conflict of interest.

S52 CONVENTIONAL OXYGEN THERAPY VERSUS CPAP AS A CEILING OF CARE IN WARD-BASED PATIENTS WITH COVID-19: A MULTI-CENTRE COHORT EVALUATION.

L Pearmain is supported by the MRC (MR/R00191X/1)

S54 ELEVATED NETOSIS AND MIGRATION BUT IMPAIRED ANTI-MICROBIAL RESPONSES IN NEUTROPHILS FROM NON-ICU, HOSPITALIZED COVID-19 PATIENTS

Funded by MRC

S60 OBSERVATIONAL STUDY OF IVACAFTOR IN PEOPLE WITH CYSTIC FIBROSIS AND SELECTED NON-G551D GATING MUTATIONS: FINAL RESULTS FROM VOCAL

Funding This study was supported by Vertex Pharmaceuticals Incorporated. Medical writing assistance was provided by Christopher Edwards, PhD, CMPP, of Articulate Science, and editorial assistance was provided by Beatrice Vetter-Ceriotti, PhD, of Complete HealthVizion

S61 RESPIRATORY MICROBIOLOGY OUTCOMES FROM AN OBSERVATIONAL STUDY OF IVACAFTOR IN PEOPLE WITH CYSTIC FIBROSIS AND NON-G551D GATING MUTATIONS (VOCAL)

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S79 SELEXIPAG TITRATION AND DOSING PATTERNS IN PATIENTS WITH PULMONARY ARTERIAL HYPERTENSION (PAH) IN A REAL-WORLD CLINICAL SETTING: INSIGHTS FROM THE EXPOSURE STUDY

Actelion Pharmaceuticals Ltd, a Janssen Pharmaceutical Company of Johnson & Johnson

S84 LONG-TERM EFFICACY OF DUPILUMAB: 3-YEAR DATA OF QUEST PATIENTS WITH MODERATE-TO-SEVERE ASTHMA ENROLLED IN LIBERTY ASTHMA TRAVERSE

Acknowledgments and funding sources Research sponsored by Sanofi and Regeneron Pharmaceuticals, Inc. ClinicalTrials.gov Identifiers: NCT02414854(QUEST)/NCT02134028(TRAVERSE). Medical writing/editorial assistance provided by Jo Mooij, PhD, of Excerpta Medica, and was funded by Sanofi Genzyme and Regeneron Pharmaceuticals, Inc., according to the Good Publication Practice guideline.

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S86 LONG-TERM ASSESSMENT OF EXACERBATIONS AND LUNG FUNCTION IN THE LIBERTY ASTHMA TRAVERSE STUDY, STRATIFIED BY LUNG FUNCTION IMPROVEMENTS AT THE END OF THE PHASE 3 LIBERTY ASTHMA QUEST PARENT STUDY

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S88 USE OF A CONNECTED INHALER SYSTEM IN THE PRE-BIOLOGIC ASSESSMENT OF PATIENTS WITH SEVERE ASTHMA

THE JOINT WORKING COLLABORATION INCLUDES GSK UK LTD., THE NHS (FOR AN UPDATED LIST OF NHS SITES PLEASE VISIT https://uk.gsk.com/en-gb/partnerships/joint-working/nhs-and-gsk-projects/projects-ending-2019-2024/. THIS IS A NON-PROMOTIONAL SERVICE EVALUATION

S90 COMPREHENSIVE MULTIOMICS ANALYSIS DEMONSTRATES SURFACTANT DYSREGULATION IN COPD

The study was funded by AstraZeneca. AstraZeneca reviewed the abstract, without influencing the opinions of the authors, to ensure medical and scientific accuracy, and the protection of intellectual property. The corresponding author had access to all data.

S92 FENO NON-SUPPRESSION IDENTIFIES CORTICOSTEROID-RESISTANT TYPE-2 SIGNALING IN SEVERE ASTHMA

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S93 CORRELATION OF EOTAXIN-3 GENE EXPRESSION AND OTHER IL-13-INDUCED GENES IN PATIENTS WITH ASTHMA

Supported by the Medical Research Council (G0800649); Faculty of Medicine, University of Southampton (A.S.), by Wellcome Trust Research Fellowships 088,365/z/09/z and 104,553/z/14/z and the Academy of Medical Sciences (T.S.C.H.), and by Asthma UK project.

S94 ELITE ATHLETES SUSCEPTIBLE TO RESPIRATORY TRACT INFECTION ARE CHARACTERISED BY REDUCED CIRCULATING MEMORY T REGULATORY CELLS, UPPER AIRWAY MICROBIAL DYSBIOSIS AND DYSREGULATION OF SPHINGOLIPID METABOLISM.

This study was funded by the English Institute of Sport.

S97 INVESTIGATING THE PRO-FIBROTIC EFFECTS OF GALECTINS IN IPF - A POTENTIAL ROLE FOR GLYCAN-MEDIATED INTERACTIONS WITH INTEGRINS

This abstract is funded by: Medical Research Council (MRC) and Galecto Biotech

S99 FLUORESCENCE-LIFETIME IMAGING: A NOVEL DIAGNOSTIC TOOL FOR SUSPECTED LUNG CANCER

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S100 RISK OF CARDIOVASCULAR MORBIDITY AND MORTALITY IN PEOPLE WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE VERSUS THOSE WITHOUT COPD: A STRUCTURED REVIEW OF THE EVIDENCE

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S104 COST-EFFECTIVENESS OF TRIPLE THERAPY WITH BUDESONIDE/GLYCOPYRRONIUM/FORMOTEROL FUMARATE VERSUS DUAL THERAPIES IN MODERATE-TO-VERY SEVERE COPD IN THE UNITED KINGDOM: ANALYSIS BASED ON THE KRONOS STUDY

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P29 HOW ARE WE MANAGING NON-TUBERCULOUS MYCOBACTERIA PULMONARY DISEASE (NTM-PD)? RESULTS FROM THE FIRST UK-WIDE SURVEY OF CLINICAL PRACTICE.

S Bryant is administrator, NTM Network UK. CS Haworth received consultancy and speaker fees from Insmed. M Lipman is chair of NTM Network UK, and received consultancy and speaker fees from Insmed.

P44 THE IMPACT OF LACK OF PROFICIENCY IN ENGLISH ON ASTHMA CONTROL

No funding has been provided for this but Gary Hellens and Richard Lawson of AstraZeneca have contributed their time to this project

P48 LONG-TERM EFFICACY OF DUPILUMAB IN PATIENTS WITH MODERATE-TO-SEVERE ASTHMA IN THE LIBERTY ASTHMA TRAVERSE OPEN-LABEL EXTENSION STUDY: IMPROVEMENTS IN ASTHMA CONTROL AND HEALTH-RELATED QUALITY OF LIFE

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X Mao, M Hardin, AH Khan: Sanofi – employees, may hold stock and/or stock options in the company. N Amin, Y Zhang: Regeneron Pharmaceuticals, Inc. – employees and shareholders.

P50 USE OF ACCELEROMETERS TO COMPARE PHYSICAL ACTIVITY LEVELS IN PARTICIPANTS WITH ASTHMA GROUPED BY BODY MASS INDEX AND ASTHMA SEVERITY

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P56 CHRONIC COUGH IN GERMANY: PREVALENCE AND PATIENT CHARACTERISTICS

This study was funded by a grant from Merck Sharp & Dohme Corp., a subsidiary of Merck & Co., Inc., Kenilworth, NJ, USA

P58 THE PREVALENCE OF CHRONIC COUGH AMONGST FEMALES WITH STRESS URINARY INCONTINENCE

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P59 BASELINE CHARACTERISTICS AND MEDICAL HISTORY OF PATIENTS WITH REFRACTORY OR UNEXPLAINED CHRONIC COUGH PARTICIPATING IN TWO GLOBAL PHASE 3 CLINICAL TRIALS

This study was supported by Merck Sharp & Dohme Corp., a subsidiary of Merck & Co., Inc., Kenilworth, NJ, USA. L McGarvey has received grants from Afferent Pharmaceuticals/Merck & Co., Inc., British Heart Foundation, Chiesi, EU Interreg VA Health & Life Science Programme, and NC3Rs; personal fees from Afferent Pharmaceuticals/Merck & Co., Inc., Applied Clinical Intelligence, and AstraZeneca; grants for travel and subsistence for attendance to scientific meetings from Boehringer Ingelheim, Chiesi, and GlaxoSmithKline; and advisory board/consultancy fees from Almirall, Boehringer Ingelheim, GlaxoSmithKline, and NAPP. SS Birring has received grants from Merck & Co., Inc.; scientific advisory board and consultancy fees from Bayer, Menlo, Merck & Co., Inc., Patara, Pfizer, and Sanofi; speaker fees from Roche; and grants for travel and subsistence for attendance to scientific

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P61 POOLED ANALYSIS OF OBJECTIVE COUGH FREQUENCY IN PARTICIPANTS WITH CHRONIC COUGH TREATED WITH GEFAPIXANT IN TWO PHASE 3 CLINICAL TRIALS (COUGH-1 AND COUGH-2)

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P63 ASSESSING WHICH PATIENT RELEVANT FEATURES OF AN OSCILLATING POSITIVE EXPIRATORY PRESSURE (OPEP) DEVICE ARE MOST IMPORTANT IN THE REAL WORLD – RESULTS FROM AN INDEPENDENT CLINICAL ASSESSMENT IN UK

TMI supplied Aerobika evaluation forms but all data was collected independently by each NHS site

P73 IMPLEMENTATION OF A COMPUTER GUIDED CONSULTATION (INTELLIGENT CLINICAL DECISION SUPPORT SYSTEM SOFTWARE) IN THE LIVERPOOL SLEEP SERVICE: THE CREATION OF A DIGITAL ECOSYSTEM TO TRANSFORM PATIENT PATHWAYS

The Computer guided Consultation/Clinical Decision Support System is owned by Lunghealth Ltd. (Swaffham, UK). Drs Chakrabarti, Angus and Professor Pearson are Directors in Lunghealth Ltd

P74 DIGITAL TRANSFORMATION – THE BEATING HEART OF A MODERN COPD SERVICE

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P81 **AN AHP-LED, QUALITY IMPROVEMENT PROJECT TO REDUCE THE HOSPITALISATION RATE OF PATIENTS WITH ACUTE EXACERBATION OF COPD**

On behalf of the COPD24 Group, who kindly provided funding, and the AHP Front Door and Medical Teams and Chief AHP - NHS Greater Glasgow and Clyde

P85 **RESPIRATORY DEPRESSION IN OPIOID DEPENDENT CHRONIC OBSTRUCTIVE PULMONARY DISEASE PATIENTS**

NJ Kalk, CJ Jolley, GF Rafferty, M Kelleher, J Moxham, PSP Cho, M Lozano-Garcia declare no conflict of interest. B Tas is supported by the National Institute for Health Research (NIHR) Biomedical Research Centre for Mental Health at South London and Maudsley NHS Foundation Trust and King's College London

P100 **IMPACT OF THE COVID-19 PANDEMIC ON HEALTH SERVICES UTILISATION IN A LUNG CANCER SCREENING COHORT**

SUMMIT study funded by GRAIL Inc

P113 **SEGREGATION IN CYSTIC FIBROSIS: THE PERCEPTIONS OF PATIENTS AND CAREGIVERS**

Funding received from The Cross Trust and Royal College of Physicians and Surgeons Glasgow (medical student elective grant)

P200 **URINARY LEUKOTRIENE E4 AS A BIOMARKER IN NSAID EXACERBATED RESPIRATORY DISEASE (N-ERD): A SYSTEMATIC REVIEW AND META-ANALYSIS**

Funded by Asthma UK Centre of Applied Research

P201 **TO WHAT EXTENT DOES THE PROTOTYPE ORACLE SCALE PREDICT TREATMENT BENEFITS? PREDICTED VERSUS OBSERVED IMPACT OF ANTI-INFLAMMATORY TREATMENTS.**

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P206 **UTILITY OF ADHERENCE CHECKS IN PATIENTS WITH SEVERE ASTHMA ELIGIBLE FOR BIOLOGICS: A SINGLE CENTRE RETROSPECTIVE ANALYSIS**

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Professor Jane Davies
Professor Andres Floto
Dr Amanda Goodwin
Professor John Hurst
Dr Akhilesh Jha
Dr Neelam Kumar
Dr Philip Molyneaux
Dr Nicola Roberts
Dr Chris Scotton
Dr Aashish Vyas
Dr Tom Ward

The Society's Specialist Advisory Groups also provided suggestions for symposia content.

Topic Leaders, who organised the symposia, were:

Dr Ahsan Akram
Dr Chris Barber
Dr Nazia Chaudhuri
Dr David Connell
Professor Jane Davies
Professor Andres Floto
Professor John Hurst
Dr Akhilesh Jha
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Dr Philip Molyneaux
Professor Kevin Mortimer
Dr Nicola Roberts
Professor Elizabeth Sapey
Dr Chris Scotton
Dr Aashish Vyas

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Professor Elizabeth Sapey
Dr Chris Scotton

The refereeing of the abstracts was performed by:

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COPD: chronic obstructive pulmonary disease; **DPI:** dry powder inhaler; **ICS:** inhaled corticosteroid; **LABA:** long-acting β_2-agonist; **LAMA:** long-acting muscarinic antagonist; **SPC:** Summary of Product Characteristics.

References: 1. Trimbow NEXThaler 88/5/9 Summary of Product Characteristics. Chiesi Limited. **2.** Singh D. *Tuberc Respir Dis*. 2017; 80: 317–324.

Trimbow 87/5/9 Pressurised Metered Dose Inhaler (pMDI) & Trimbow 88/5/9 NEXThaler Prescribing Information

Please refer to the Summary of Product Characteristics (SPC) before prescribing. **Presentation**: Each Trimbow 87/5/9 pMDI delivered dose contains 87micrograms (mcg) of beclometasone dipropionate (BDP), 5mcg of formoterol fumarate dihydrate (formoterol) and 9mcg of glycopyrronium. Each Trimbow 88/5/9 NEXThaler delivered dose contains 88 micrograms of BDP, 5 micrograms of formoterol and 9 micrograms of glycopyrronium These are both the equivalent to a metered dose of 100mcg BDP, 6mcg formoterol and 10mcg glycopyrronium. **Indication:** ***COPD:*** Maintenance treatment in adult patients with moderate to severe chronic obstructive pulmonary disease (COPD) who are not adequately treated by a combination of an inhaled corticosteroid and a long-acting beta2-agonist or a combination of a long-acting beta2-agonist and a long-acting muscarinic antagonist (for effects on symptoms control and prevention of exacerbations see section 5.1 of the SPC). ***Asthma (Trimbow 87/5/9 pMDI only):*** Maintenance treatment of asthma, in adults not adequately controlled with a maintenance combination of a long-acting beta2-agonist and medium dose of inhaled corticosteroid, and who experienced one or more asthma exacerbations in the previous year. **Dosage and administration:** For inhalation in adult patients (≥18 years). ***COPD & Asthma:*** 2 inhalations twice daily. Maximum dose 2 inhalations twice daily. Trimbow pMDI can be used with the AeroChamber Plus® spacer device. Patients should be advised to take Trimbow every day even when asymptomatic. If symptoms arise in the period between doses, an inhaled, short-acting beta2-agonist should be used for immediate relief. When choosing the starting dose strength of Trimbow in asthma patients, the patients' disease severity, their previous asthma therapy including the inhaled corticosteroid (ICS) dose as well as the patients' current control of asthma symptoms and risk of future exacerbation should be considered. The aerosol particles of Trimbow are characterised by an extrafine particle size distribution. For BDP this results in a more potent effect than formulations of BDP with a non-extrafine particle size distribution (100mcg of BDP extrafine in Trimbow are equivalent to 250mcg of BDP in a non-extrafine formulation). **Contraindications:** Hypersensitivity to the active substances or to any of the excipients. **Warnings and precautions:** Not for acute use in treatment of acute episodes of bronchospasm or to treat an acute disease exacerbation. Discontinue immediately if hypersensitivity or paradoxical bronchospasm occur. Deterioration of disease: Trimbow should not be stopped abruptly. Cardiovascular effects: Due to the presence of a long-acting beta2-agonist and a long-acting muscarinic antagonist, use with caution in patients with cardiac arrhythmias, idiopathic subvalvular aortic stenosis, hypertrophic obstructive cardiomyopathy, severe heart disease, occlusive vascular diseases, arterial hypertension and aneurysm. Caution should also be used when treating patients with known or suspected prolongation of the QTc interval (QTc > 450 milliseconds for males, or > 470 milliseconds for females) either congenital or induced by medicinal products. Limited data in asthmatic patients with cardiovascular co-morbidities or risk-factors suggest that these patients are also at higher risk of adverse reactions like local fungal infections or dysphonia. Trimbow should not be administered for at least 12 hours before the start of anaesthesia as there is a risk of cardiac arrhythmias. Caution in patients with thyrotoxicosis, diabetes mellitus, pheochromocytoma and untreated hypokalaemia. Increase in pneumonia and pneumonia hospitalisation in COPD patients receiving ICS observed. Clinical features of pneumonia may overlap with symptoms of COPD exacerbations. Systemic effects of ICS may occur, particularly at high doses for long periods, but are less likely than with oral steroids. The daily dose of both Trimbow 87/5/9 & 88/5/9 correspond to a medium dose of ICS. Possible systemic effects include Cushing's syndrome, Cushingoid features, adrenal suppression, growth retardation, decrease in bone mineral density and, more rarely, a range of psychological or behavioural effects including psychomotor hyperactivity, sleep disorders, anxiety, depression and aggression. Patients on Trimbow should be reviewed regularly and the dose of ICS is reduced to the lowest dose at which effective control of asthma is maintained. Use with caution in patients with pulmonary tuberculosis or fungal/viral airway infections. Potentially serious hypokalaemia may result from beta2-agonist therapy (particular caution with severe disease). Formoterol may cause a rise in blood glucose levels. Glycopyrronium should be used with caution in patients with narrow-angle glaucoma, prostatic hyperplasia or urinary retention. Use in patients with severe hepatic or renal impairment should only be considered if benefit outweighs the risk. Consider referral of patients reporting blurred vision or visual disturbances to an ophthalmologist as causes may include cataract, glaucoma or rare diseases such as central serous chorioretinopathy. To reduce risk of oropharyngeal candida infection, patients should be advised to rinse mouth or gargle with water without swallowing or brush teeth after inhaling prescribed dose. Trimbow 88/5/9 NEXThaler contains lactose which includes small amounts of milk proteins. **Interactions:** Since glycopyrronium is eliminated via renal route, interactions could occur with medicinal products affecting renal excretion mechanisms e.g. with cimetidine (an inhibitor of OCT2 and MATE1 transporters in the kidney) co-administration, glycopyrronium showed a slight decrease in renal clearance (20%) and a limited increase in total systemic exposure (16%). Possibility of systemic effects with concomitant use of strong CYP3A inhibitors (e.g. ritonavir, cobicistat) cannot be excluded and therefore caution and appropriate monitoring is advised. *Related to formoterol:* Non-cardioselective beta-blockers (including eye drops) should be avoided as reduces effect of formoterol. Concomitant administration of other beta-adrenergic drugs may have potentially additive effects. Concomitant treatment with quinidine, disopyramide, procainamide, antihistamines, monoamine oxidase inhibitors (MAOIs), tricyclic antidepressants and phenothiazines can prolong the QTc interval and increase the risk of ventricular arrhythmias. L-dopa, L-thyroxine, oxytocin and alcohol can impair cardiac tolerance towards beta2-sympathomimetics. Hypertensive reactions may occur following co-administration with MAOIs including drugs with similar properties (e.g. furazolidone, procarbazine). Risk of arrhythmias in patients receiving concomitant anaesthesia with halogenated hydrocarbons. Concomitant treatment with xanthine derivatives, steroids or diuretics may potentiate a possible hypokalaemic effect of beta2-agonists. Hypokalaemia may increase the likelihood of arrhythmias in patients receiving digitalis glycosides. *Related to glycopyrronium:* Co-administration with other anticholinergic-containing medicinal products is not recommended. *Excipients:* Presence of ethanol in Trimbow 87/5/9 pMDI may cause theoretical potential interaction in sensitive patients taking metronidazole or disulfiram. **Fertility, pregnancy and lactation:** No studies have been performed in regards to safety in human fertility, but animal studies show impaired fertility. Should only be used during pregnancy if the expected benefits outweigh the potential risks. Children born to mothers receiving substantial doses should be observed for adrenal suppression. Glucocorticoids and metabolites are excreted in human milk. It is unknown whether formoterol or glycopyrronium (including their metabolites) pass into human breast-milk but they have been detected in the milk of lactating animals. Anticholinergics like glycopyrronium could suppress lactation. A decision must be made whether to discontinue breastfeeding or to discontinue/ abstain from therapy. **Effects on driving and operating machinery:** None or negligible. **Side effects:** *Common*: pneumonia (in COPD patients), pharyngitis, oral candidiasis, urinary tract infection, nasopharyngitis, headache, dysphonia. *Uncommon:* influenza, oral fungal infection, oropharyngeal candidiasis, oesophageal candidiasis, fungal oropharyngitis, sinusitis, rhinitis, gastroenteritis, vulvovaginal candidiasis, granulocytopenia, dermatitis allergic, hypokalaemia, hyperglycaemia, restlessness, tremor, dizziness, dysgeusia, hypoaesthesia, otosalpingitis, atrial fibrillation, electrocardiogram QT prolonged, tachycardia, tachyarrhythmia, palpitations, hyperaemia, flushing, hypertension, asthmatic crisis, cough, productive cough, throat irritation, epistaxis, pharyngeal erythema, diarrhoea, dry mouth, dysphagia, nausea, dyspepsia, burning sensation of the lips, dental caries, aphthous stomatitis, rash, urticaria, pruritus, hyperhidrosis, muscle spasms, myalgia, pain in extremity, musculoskeletal chest pain, fatigue, C-reactive protein increased, platelet count increased, free fatty acids increased, blood insulin increased, blood ketone body increased, cortisol decreased. *Rare*: Lower respiratory tract infection (fungal), hypersensitivity reactions, including erythema, lips, face, eye and pharyngeal oedema, decreased appetite, insomnia, hypersomnia, angina pectoris (stable and unstable), extrasystoles (ventricular and supraventricular), nodal rhythm, sinus bradycardia, blood extravasation, paradoxical bronchospasm, exacerbation of asthma, oropharyngeal pain, pharyngeal inflammation, dry throat, angioedema, dysuria, urinary retention, nephritis, asthenia, blood pressure increased, blood pressure decreased. *Very rare*: thrombocytopenia, adrenal suppression, glaucoma, cataract, dyspnoea, growth retardation, peripheral oedema, bone density decreased. *Frequency not known*: psychomotor hyperactivity, sleep disorders, anxiety, depression, aggression, behavioural changes, blurred vision. (Refer to SPC for full list of side effects). **Legal category:** POM. **Price and Pack:** £44.50 1x120 actuations. **Marketing authorisation (MA) No(s):** PLGB 08829/0193 (GB), EU/1/17/1208/002 (UKNI), PLGB 08829/0200 (GB), EU/1/17/1208/010 (UKNI). **GB MA holder/UKNI Distributor:** Chiesi Limited, 333 Styal Road, Manchester, M22 5LG, United Kingdom. **Date of Preparation:** Apr 2021.

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