Delivering rehabilitation to patients surviving COVID-19 using an adapted pulmonary rehabilitation approach – BTS guidance

Introduction

This document outlines British Thoracic Society (BTS) guidance on the adaptation of pulmonary rehabilitation to meet the recovery needs of the post COVID-19 patient. This document may require updating as more information becomes available. This version was published on 16 September 2020. Please check the BTS website for the most up to date version of this document.

This guidance focuses on the how pulmonary rehabilitation services may adapt their programme to accommodate the needs of the post COVID-19 patient.

The most effective form of rehabilitation for COVID-19 survivors remains unproven, and there is no evidence that rehabilitation is beneficial for COVID-19 survivors. However there is some evidence from previous outbreaks of viral pneumonias that a PR-based programme might be effective (1). There also a number of commonalities in symptoms between chronic respiratory disease and COVID-19, suggesting some clinical rationale to support the adaptation of existing programmes to accommodate post COVID-19 patients. Empirical evidence also indicates that existing 'traditional/typical' PR services are beginning to receive increased referrals for post COVID-19 patients, and therefore in the absence of evidence to date, the provision of guidance is also necessary to support these clinical services.

This guidance can only be pragmatic, but aims to describe in sufficient detail likely adaptations to guide services to support this population. This lack of a robust evidence base for COVID-19 recovery programmes means that in collaboration with their patient, rehabilitation teams can choose to adapt the intervention to best suit the needs of the patient.

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Background

Those discharged from hospital after treatment for COVID-19, and potentially those managed in the community are likely to report significant ongoing physical, functional, and psychological impairment. There is a need to develop an appropriately targeted and safe rehabilitation programme to support the recovery of this population.

Pulmonary rehabilitation (PR) teams are well placed to deliver such a programme for this group recognising that the typical structure, content, and format of PR interventions will require adaptation to meet the specific needs of post COVID-19 patients. The commonly reported symptoms are cough, breathlessness and fatigue (2), and these symptoms are, to a degree, managed within the existing PR programme. However, the broader recovery needs of the post COVID-19 patient may extend beyond the traditional boundaries of PR and therefore existing services are likely to need to extend their scope of practice and collaborate with a wider multi-professional network in order to ensure that these recovery needs are met in an adapted rehabilitation programme.

We have the opinion of over 1,000 health care professionals who participated in the BTS COVID-19 Rehabilitation Survey (3) to help steer the adaptations required.

There are also large numbers of patients, not admitted to hospital but who had suspected or confirmed COVID-19 disease in the community, and who still report significant symptoms that may require rehabilitation. Importantly, some of these patients may already have experienced protracted duration of symptoms with a significant impact on their function and psychological well-being.

Practical Guidance - Adapting rehabilitation to accommodate the post COVID-19 patient

Locally negotiated pathways to facilitate appropriate, safe and timely referral of all these groups into suitable rehabilitation programmes need to be developed.

Additional resources will be required as teams are already addressing a backlog of people needing PR against a background of similar constraints to reopening rehabilitation services.

The flow diagram at Appendix 1 may be a useful tool to help ensure a comprehensive rehabilitation pathway.

Selection of patients

Inclusion - There are several distinct groups of patients who will likely benefit from out-patient rehabilitation following COVID-19:

- Following discharge from a hospital admission:
    - A comparatively small proportion who received care on Intensive care unit (ICU) +/- invasive mechanical ventilation due to Covid-19.
    - A proportion that had a prolonged stay in hospital, often receiving relatively high flow of oxygen therapy and some who may have received non-invasive ventilation. In "usual" non-pandemic times, these patients may have been cared for on ICU.
    - Other patients presenting with core/ respiratory symptoms with an in-patient stay +/- evidence of pneumonia.
    - Patients with persisting symptoms most likely due to COVID-19 but who didn't require hospital admission. In light of the testing availability at the time, some of these patients may not have been swabbed and therefore will require best clinical judgement.

Whilst those on ICU or those with a prolonged hospital stay are more likely to have ongoing rehabilitation needs, it is clear that others would benefit to a similar degree.

It is highly likely that many of these patients will have no prior chronic lung disease therefore the goal of rehabilitation is to facilitate full recovery.

The rehabilitation team should be aware of the potential for patients to develop further complications associated with COVID-19 not manifest at discharge/referral.

Exclusion - Patients who fall into the following categories should be excluded from this targeted COVID-19 rehabilitation programme:

- Patients admitted to hospital with COVID-19 but presenting predominantly with problems related to neurological, cardiac, renal, or polytrauma or other body systems may be better suited to specific predefined pathways for rehabilitation including, for example, complex neurological or stroke rehabilitation. Similarly, patients presenting with fall-related injuries should be referred to appropriate local falls prevention services.

- Patients presenting with COVID-19 but with co-existent active cancer requiring treatment decisions and plans, would be best initially managed on the cancer pathway.

- Patients presenting a) from nursing homes, b) with severe frailty, c) in the end of life period and d) with overwhelming palliative care needs may not benefit from this rehabilitation intensity, nature and style and be better managed using alternative pathways.

- There will also be a group of patients with persisting rehabilitation needs requiring in-patient multidisciplinary rehabilitation following a prolonged or severe hospital admission. The proposed rehabilitation detailed here does not replace this but may take place at a later date.

- Those with suspected active COVID-19 infection, particularly if COVID-19 was not confirmed during an initial "influenza like" illness.

Setting up a programme

The site

Guidance about the safe resumption and continuation of any PR or respiratory service is detailed in the BTS document 'Guidance for the Resumption and Continuation of Urgent and Elective Outpatient Respiratory Services. Part 1' which can be accessed at: https://www.brit-thoracic.org.uk/about-us/Covid-19-resumption-and-continuation-of-respiratory-services/ (4).

Each training venue will have different geography so it is impossible to provide site specific guidance. For adapted PR programmes for post-COVID-19 patients, implementing appropriate infection prevention and control measures to ensure the safety of patients and clinicians is imperative.

Rehabilitation providers should risk assess their current venue(s) to optimise safe distancing in conjunction with local Infection Prevention and Control (IPC) leads. Where multiple venues are used, training should be delivered at a site or sites where opportunities for social distancing are better (typically larger venues) and where faster airflow is possible.

Pre-appointment screening

The potential risks of the assessment visit should be discussed with patients and carers, who need to be involved in any decisions about assessment (exercise testing) and subsequent supervised centre-based training or home-based rehabilitation. Patients may prefer to attend sites away from 'acute'/'hot' healthcare sites.

One to two days before the assessment/rehabilitation session, the patient should be contacted to ensure they have no symptoms of COVID-19. If they have symptoms of COVID-19 they should be advised to self-isolate for 10 days or in line with current guidance. If they have no symptoms, the patient should be advised to attend the appointment but to contact the organiser and not attend should they develop subsequently symptoms of COVID-19. When available, details from the contact tracing App should be discussed at the assessment.

If available, swab testing could complement these measures noting that there is a significant false negative rate. Currently, knowledge of antibody testing results should not change this process but this advice may change over time.

The Assessment

On arrival, acute symptoms and the patient's temperature should be checked. If it is 37.8 degrees Celsius or greater they should be sent home to self-isolate for 10 days (or in line with guidance).

Much of the baseline assessment could be conducted virtually but there is a requirement to conduct an exercise test to establish safety to exercise and effective prescription of exercise. This cannot be conducted virtually.

Ensure that waiting facilities allow for social distancing or ask patients to wait in their car until their appointment time. If the patient has a mobile phone they can be called or alternatively they could be informed by a member of the team when the team is ready to complete their assessment.

Attempt to maintain a unidirectional flow of patients through the department to minimise face to face contact.

All equipment must be decontaminated after use by an individual.

The venue must be cleaned after each assessment as instructed by local IPC leads.

The assessment needs to incorporate a wider assessment of patients' needs and be cognisant of the premorbid status of these patients.

Complications of COVID-19 that need to be considered at the time of the initial assessment.

Acute Deep Vein Thrombosis and Pulmonary embolism

- Emerging data and clinical experience suggest an increased prevalence of coagulopathy and venous thromboembolic events (deep vein thrombosis (DVT) and pulmonary embolism (PE)) in COVID-19, especially in patients with more severe disease. [See BTS Guidance on Venous Thromboembolic Disease in patients with COVID-19 disease – https://www.brit-thoracic.org.uk/document-library/quality-improvement/covid-19/bts-guidance-on-venous-thromboembolic-disease-in-patients-with-covid-19/(5)].
- There is limited data examining the safety of exercise training in acute venous thromboembolic disease.
- Before physical activity or exercise training is considered, ensure patients with acute venous thromboembolic disease are receiving therapeutic anticoagulation, and there has been no adverse bleeding from anticoagulation.
- Early ambulatory physical activity in patients anticoagulated with DVT or PE is safe.
- Supervised PR with moderate-high intensity exercise-training can be considered after four weeks of therapeutic anticoagulation for DVT or PE.

- Taking a careful history is key, and identification of a past history of thromboembolic event or myocarditis or new symptoms such as chest pain or worsening shortness of breath should alert the therapist to liaise carefully with the individual's responsible clinician.
- It is recommended that as part of the subjective PR assessment, a standardised checklist should be used to identify possible contraindications to exercise. (see appendix 2)

Myocarditis

- Myocarditis should be suspected in patients with COVID-19and acute-onset chest pain, ST segment changes, cardiac arrhythmia(s) and haemodynamic instability. In addition, LV dilatation, global/multi-segmental LV. hypocontractility (on echocardiography), and a significant increase in cardiac troponin and BNP/NT-proBNP levels, in someone who does not have significant coronary artery disease.
- A diagnosis of myocarditis should be considered in COVID-19 patients with acute heart failure or coronary syndrome who do not have pre-existing cardiovascular disease or cardiovascular risk factors.
- It is recommended that PR should be delayed for at least six months in COVID-19 patients recovering from myocarditis. Clinical reassessment will be required at that point to determine safety of exercise training.

Outcome measures to capture the impact of COVID-19

Whilst many of the measures deployed in PR may be important there are additional and important symptoms of COVID-19 patient that are not routinely captured in a PR assessment. These proposed outcome measures are based on empirical learning about the clinical presentation and symptoms of post COVID-19 patients, recommendations from relevant existing core outcome sets for patients with critical illness (6;7), and other important concerns for this population such as return to work given the demographic (primarily younger age).

It should be noted that these questionnaires have not been validated in the COVID-19 patient.

Whilst we are developing and adapting rehabilitation programmes it is particularly important that outcomes are carefully measured and as further insight is gained that programmes are adapted accordingly.

Proposed additional clinical outcomes and measures to be completed at the baseline assessment and upon completion of rehabilitation for an adapted PR to accommodate post COVID-19 patients are presented:

- Health-related quality of life; measured using EQ-5D-5L (8).

- Mental Health; measured using Impact of Event Scale-revised for post-traumatic stress disorder [PTSD (9)].

- Fatigue; measured using
    - Option 1. Functional Assessment of Chronic Illness Therapy-Fatigue Scale (10).
    - Option 2. Fatigue Severity Scale (11).
    - Option 3. Chalder fatigue Scale (12).
    - Option 4. A VAS scale for fatigue

- Return to work;
  There is no standard measure for capturing employment status. This is a single question to capture the best description of working status (adapted from 'Return to Work' assessment, available at www.improvelto.com):

  Which describes your current employment situation? (more than one may apply)

  Retired/disability
  Working full time
  Working part time
  On paid sick leave, but still employed
  On unpaid sick leave, but still employed
  Temporarily laid off (without pay)
  Unemployed – presently in a health care facility
  Unemployed and not looking for work
  Unemployed and looking for work
  Going to School
  Volunteer
  Home maker/child care/elder care
  New retirement
  Receiving new disability payments
  Awaiting new approval of disability payments
  Furloughed
  Prefer not to say
  Other
  Don't know

This question needs to be asked both about current status but also whether the patient was working in the 6 months prior to COVID-19. This allows full assessment of recovery goals.

These questionnaires are suitable for clinical use and are relatively short to conduct and score.

Additional considerations

The symptoms of COVID-19 can extend beyond those commonly reported during a routine PR assessment. Therefore the scope of the assessment may need to be increased to understand the impact of the virus and associated management ensure appropriate onward referral to relevant multiprofessional colleagues.

Additional considerations include;

- Dysfunctional breathing may require referral to a physiotherapist with specialist skills in this area. Completion of the Nijmegen questionnaire (13) may be valuable for these referrals. (It should be noted that this questionnaire was developed for those with no known lung disease).
- Speech and swallowing problems may require a referral to a Speech and Language Therapist.
- New shoulder problems as a consequence of proning may require referral to a musculoskeletal specialist.
- Peripheral neuropathy may require referral to the Peripheral Nerve Injury Unit.
- Symptoms suggestive of PTSD may require referral to a psychologist.
- Lack of taste/appetite may require a referral to the dietitian.
- Fatigue may benefit from referral to an occupational therapist, or physiotherapist with expertise in post viral fatigue syndrome.
- Cognitive function may be disrupted and an onward referral may be indicated for a more detailed assessment. There is no consensus in the post ICU literature about the optimum assessment tool but the Montreal Cognitive Assessment is most widely used (7).

Exercise testing

Exercise testing (field-based exercise tests) and training are not classified as aerosol generating (AGP) but will produce droplets, which require a) distancing during the assessment and any subsequent centre-based exercise training, b) changes in airflow, and c) subsequent cleaning. Staff will need to wear PPE consisting of a surgical mask, apron and gloves (plus a visor or goggles based on local risk assessment) as they may need to respond rapidly to any adverse event during exercise testing/training and this may not allow sufficient time to ‘don’ PPE.

The recommended tests in the BTS Guidance are the 6 Minute Walking Test and the Incremental Shuttle Walking Tests (14;15). They are the most appropriate to assess desaturation and allow effective exercise prescription.

The programme

Adapting to accommodate the post COVID-19 patient

Acknowledging the reported overlap in many symptoms, in the post COVID-19 patient with the more traditional candidates for pulmonary rehabilitation many clinicians will naturally look to adapt existing PR as one option to meet the emerging need to support recovery. Suggestions for an adapted the PR to accommodate post COVID-19 patients are presented.

Timing

- There is clearly a current and growing demand for a post COVID-19 recovery programme.
- Translating guidance from conventional COPD post discharge PR to patients recovering from COVID-19 is likely to be inappropriate given the uncertainty around infection and viral load.
- Survivors of COVID-19 who were either managed in the community or admitted to hospital and who require rehabilitation (see section 1. “Selection of patients.”) should be referred to their local PR service at least 6-8 weeks after recovery from COVID-19.
- Primary care can refer in to the recovery programme as clinical need indicates (16).
- Post COVID-19 critical illness patients may be referred via ICU Follow-up Clinics (where locally available) and timing of referral may be dependent on review within this service.

Adaptations to the programme

- Fatigue – Whilst muscle fatigue is reported by individuals with chronic lung disease the fatigue experienced by the post COVID-19 patient may be quite different. This may manifest in the early post COVID-19 phase as decreased exercise tolerance/fatigue, muscle pain and weakness. Specialist input from occupational therapists will be valuable. As time progresses symptoms may include activity induced fatigue (both mental and physical), unrefreshing sleep, persistent cognitive problems and the inability to perform usual daily activities. The approaches to exercise may be subtly different and support may be required from experts in the management of chronic fatigue syndrome/ post viral fatigue syndrome.
- Mood disturbances – PR is effective at reducing anxiety and depression but there may be more complex emotional impacts of COVID-19. These may require advice and input from other health care professionals e.g. psychologists, occupational therapists.
- Cognitive function – This may be associated with post viral fatigue. Therefore it is important to adapt a programme accordingly. Assessments should be offered at a ‘good’ time of day for the individual. Advice and information should be clear and succinct.
- Support to return to work – This may be important for many patients returning to work after recovering from COVID-19. Return to work after illness can be challenging in many ways. Persisting symptoms such as shortness of breath, fatigue, poor

concentration, and anxiety can be particularly challenging. For those patients wishing to return to work, their rehabilitation programme should include aspects to facilitate this process, including referral to, and input from occupational health and occupational therapy departments.

It is important to recognise that supporting post COVID-19 patients can be emotionally challenging for the therapy team, so departments need to put in place a support structure to look after the emotional well-being of staff.

The exercise component

There is currently no evidence describing the effectiveness of therapeutic exercise strategies in the COVID-19 population. As a consequence of bed rest, individuals are likely to be deconditioned. Equally, the current data would suggest that fatigue is a very dominant symptom of the post COVID-19 patient.

The principles of exercise prescription remain as described for those that have significant deconditioning and breathlessness. In addition survivors of Covid-19 who report fatigue may benefit from an exercise programme prescribed using the principles of graded exercise therapy (16).

The education component

The educational component of PR is fundamentally integral to the format and success of the programme (14). Although education comes into every aspect of PR this section relates to the discrete education sessions that may be required by post COVID-19 patients. PR education programmes for post COVID-19 patients should be delivered by a multidisciplinary team (including from outside the PR specialty), supplemented with written material and the patient should have an opportunity to ask questions. Some topics suggested below may be particularly relevant for patients who were admitted to ICU with critical COVID-19 illness, and it may be necessary to have critical care clinicians contribute to the education element of adapted PR programmes, and/or identify a critical care specialist colleague who could contact any post ICU patients outside of the session to provide relevant, specific information.

This guidance is based on expert opinion and NHSE guidance (16) “After-care needs of inpatients recovering from COVID-19.”

COVID-19:

- Disease anatomy, physiology and pathology.
- Infection control (as per Public Health England’s guidance).

- Respiratory care:
  - Management of breathlessness and cough, including chronic cough.
  - For relevant patients, information on ambulatory and long-term oxygen therapy.

    - For relevant patients, information on tracheostomy care.
- Fatigue management:
    - Sleep hygiene, pacing strategies, energy conservation, graded exercise therapy, gradual resumption of activities, mitigation of the development of chronic fatigue.
- Musculoskeletal problems:
    - Management of muscle atrophy as well as reduced fitness levels and activities of daily living / functional performance.
    - For relevant patients, management of neuropathy with information on ulceration and infection control.
- Nutritional management:
    - For relevant patients' education on diet enrichment.
    - For relevant patients swallow retraining.
- Psychological care:
    - Management of anxiety and depression.
    - For relevant patients, information on delirium and possible associated cognitive impairment.
    - For relevant patients, information on post-traumatic stress disorder.
- Social issues:
    - Return to work, return to driving, sexual relationships, social isolation/ loneliness.

Centre based programmes

Each training venue will have different geography so it is impossible to provide site specific guidance.

Ideally, arrival at the venue should be staggered and patients should only enter the venue when invited. Carers should only accompany patients into the venue where this is unavoidable and should not be present during the class unless this is essential to facilitate training.

There should be a unidirectional flow of patients through the department to minimise face to face contact.

Social distancing should be maintained throughout and each participant should remain in one area of the training venue and have dedicated equipment for each session. The number of participants must be limited to allow social distancing, and will be dictated by the size of the facility.

All equipment must be decontaminated after use by an individual. In practice this means that only one person can use a piece of equipment during each session. This will necessitate redesign of training programmes. Participants should not rotate through a 'circuit' of exercises.

All patients and providers should wear a face mask whenever possible. They can be removed during exercise and immediate recovery but should be replaced during rest periods.

Current patients undergoing face to face rehabilitation should also be reminded at every session to contact service providers and delay attendance if they notice new Covid-19 related symptoms in-between appointments.

After completion of exercise training session

Service leads need to confirm their airflow changes in all exercise training venues to determine how long the rooms need to be left empty before cleaning. Re-use by another group (for any purpose) will be limited by this.

The venue must be cleaned after an exercise class as instructed by local IPC leads. Consideration should be given to the use of additional cleaning staff time to support this.

Safety precautions for supervised interventions

As there is currently insufficient evidence for post COVID-19 rehabilitation, patient safety during the delivery of post COVID-19 supervised exercise should be informed by the BTS Guideline on Pulmonary Rehabilitation (14).

Safety considerations include;
Infection control (as documented above to include space and equipment etc).
Exercise induced desaturation (and subsequent oxygen management).
Medical emergencies (as would prevail in routine PR).
Monitoring for pre-existing health issues (e.g. increase incidence of diabetes).

Safety precautions for remotely supervised interventions

There is no evidence that remotely supervised recovery programmes are beneficial for COVID-19 survivors.

As outlined in the companion guidance "BTS Guidance for pulmonary rehabilitation - Reopening services for the 'business as usual' participants" remote delivery of PR could be considered using a variety of platforms (manual and digital based solutions) for the Covid-19 patient.

For remotely supervised programmes

- Written or verbal consent should be obtained.
- Confirm that the patient is aware of adverse signs and symptoms associated with exercising at home.
- Confirm the patient has a safe environment to exercise in.
- Keep regular contact with clinicians to review progress and any relapse.

- Use validated measures of breathlessness and exertion/fatigue to monitor response to exercise prescription.
- The individual will need access to any equipment required to complete the interventions effectively and safely.
- Use of a walking diary to monitor exercise progression.
- Deliver appropriate advice for any outside walking prescription in line with government policy for COVID-19 shielding and/or social distancing.
- Safety and the exercise prescription must be assessed at the time of an initial assessment
- Oxygen requirements should be established at the time of the initial assessment (therefore an oximeter is not mandated).

Workforce issues and training

- There will be training needs for staff supporting post COVID-19 patients. This can be provided locally by the wider multi-disciplinary team.

- Health Education England are currently developing a site to support staff (qualified and unqualified) to support the recovery of the post COVID-19 patients.

- There is unlikely to be capacity to accommodate the needs of post- COVID-19 patients within existing PR services without significant investment, new commissioning or deployment of staff.

Supplementary materials

<u>Evidence</u>

a) Post COVID-19 PE
    - Emerging data and clinical experience suggest an increased prevalence of coagulopathy and venous thromboembolic events [deep vein thrombosis (DVT) and pulmonary embolism (PE)] in Covid-19, especially in patients with more severe disease (5).
    - Compared with bed rest, early ambulation of patients with DVT, PE or both, is not associated with a higher risk of progression of DVT, new PE or death (17).
    - In a retrospective analysis of a three-week inpatient rehabilitation programme, adverse events (AEs) occurred in 57 out of 422 patients. No association was found between the physical activity interventions and the incidence of any AE. 0.9% of patients had a bleeding event associated with anticoagulation (18).
    - Early exercise-training (defined as between six-weeks and three months after index venous thromboembolism) was not associated with excess adverse events (19).
    - Cardiopulmonary exercise-testing four weeks after index massive or submassive pulmonary embolism was not associated with any adverse events (20).

- In all exercise-training studies, patients were receiving therapeutic anti-coagulation.

b) Post COVID-19 myocarditis

- Clinical experience indicates that SARS-CoV2 may lead to fulminant myocarditis (https://www.escardio.org/Education/COVID-19-and-Cardiology).
- The European Society of Cardiology advise that physical activity should be restricted during the acute phase of myocarditis and for at least 6 months in athletes and non-athletes (21).

Guidance to support a case of need for additional resources for the expansion of services to accommodate the post COVID-19 patient

- National audit data has shown that the demand for "business as usual" (BAU) PR consistently outstrips supply. PR is only offered to 13% of eligible COPD patients (22), with only 60% of patients being enrolled into PR within 90 days of referral (23).

- Delivery of post-hospitalisation PR is inconsistently delivered despite inclusion in guidelines and quality standards.

- Immediately prior to the COVID-19 pandemic, there were two initiatives to support referral to PR: the NHS Long Term Plan (22) and the introduction of a new pulmonary rehabilitation indicator in the Quality Outcome Framework (QOF) incentive scheme.

- The suspension of PR services during the COVID-19 pandemic, and redeployment of PR staff has resulted in growing waiting lists for BAU PR.

- Resumption of BAU PR services will result in reduced overall capacity for the foreseeable future due to staffing and introduction of new ways of working (see BTS Guidance for PR - Reopening services for the 'business as usual' participants).

- There is likely to be ongoing reduced staff capacity due to suspected or confirmed COVID-19 illness in staff members and their household contacts, consequences of track and trace, necessitated staff working from home (e.g. need for some staff to shield due to underlying medical conditions), and short notice redeployment to cover acute services.

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