British Thoracic Society
National Audit Report: Outpatient Management of Pulmonary Embolism 2021
National Audit Period: 1 September 2021 – 31 October 2021
Dr Robin Condliffe

Number of records submitted: 1509
Number of participating institutions: 108

Summary/Abstract

This report summarises the results of the 1st British Thoracic Society (BTS) audit of the Outpatient (OP) Management of Pulmonary Embolism (PE). The audit period was 1st September – 31st October 2021, with a data collection period until the end of January 2022. The audit consisted of 2 data collection exercises- one for patient level data, and one for organisational level data. For the purposes of this report, the Centre Level Organisational Data section will represent collected centre-level data regarding details of their OP pathway. The Patient Level Data section will represent collected data for patients diagnosed with an acute PE who were managed on an outpatient pathway. One hundred and eight institutions participated in both parts of the audit and data were recorded for 1509 patients.

Key findings:

1. 80% of centres have a formalised OP PE pathway.
2. 92% of centres have 7-day access to CTPA (CT pulmonary angiogram).
3. In patients whose diagnostic imaging was delayed by > 1hour, initial anticoagulation was not administered within the first hour in 48% of patients.
4. 26% of patients did not undergo diagnostic imaging within the first 24 hours.
5. Risk stratification using a validated tool was recorded in the notes in only 23% of patients.
6. 17% of patients assessed with PESI and 22% of patients with sPESI had a risk score >very low/low and should therefore not have been suitable for OP management.
7. The presence or absence of right ventricular strain was recorded in the notes in 58% of cases.
8. 91% of patients were assessed by a senior decision-maker prior to going home.
9. Written information was recorded as having been given in only 40% of patients.
10. Initial follow-up within 7 days of discharge occurred in only 38% of patients.
11. 87% of centres offer 3-month follow-up.

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National Improvement Objectives:

1. A validated risk stratification score should be recorded in the notes of all patients managed on an OP PE pathway. **Target 90%**
2. Initial anticoagulation should be administered within 1 hour of clinical suspicion of PE, unless the diagnosis has already been excluded. **Target 90%**
3. All patients should receive written information including emergency contact details and follow-up within 7 days of going home. **Target 90%.**

Timeline: 18 months from report publication.

Background

Acute PE has an annual incidence of ≈30-80/100,000/year.[1-3] Between 37-44% of patients attending hospital with a diagnosis of PE are suitable for OP management.[4-6] A significant number of patients presenting to a UK hospital will therefore be potential candidates for OP management which is associated with a significant reduction in length of stay compared with traditional in-patient management together with high levels of patient staisfaction.[5, 7] OP management has been demonstrated to be safe in a number of randomized controlled trials and meta-analyses.[6, 8-12] Risk stratification to identify patients suitable for OP management is central to this safety; a single randomized controlled trial which observed poorer outcomes in patients managed in an OP setting did not use a validated risk score.[13] The BTS therefore published guidelines on the outpatient management of PE in 2018 and subsequent quality standards in 2020.[14, 15] The 6 quality standards are:

1. CTPA should be performed within 24 hours of presentation in patients who are managed via an outpatient pathway and do not have contraindications for contrast imaging.
2. All patients with confirmed acute PE or on an outpatient pathway for suspected acute PE should have their clinical risk assessed including the use of a validated risk score (PESI, s-PESI, Hestia).
3. Outpatient management should be offered to all patients with suspected or confirmed acute PE who satisfy clinical risk and exclusion criteria.
4. All patients managed via an outpatient PE pathway should be reviewed by a senior clinical decision-maker prior to going home.
5. All patients managed via an outpatient PE pathway should receive verbal and written information containing details of potential complications of the disease process, its treatment and a point of contact.
6. Patients undergoing outpatient management following diagnosis of an acute PE should have an initial review within 7 days of discharge. Subsequent follow-up by a senior clinician with a special interest in PE should take place within a formal pathway.

NICE also produced quality standard documents 29[16] and 201[17] which include standards relevant to OP PE management:

- People with suspected PE are offered an interim dose of anticoagulation therapy if diagnostic investigations are expected to take longer than 1 hour from the time of first clinical suspicion
- People without cancer who receive anticoagulation therapy have a review within 3 months of diagnosis to discuss the risks and benefits of continuing anticoagulation therapy
- People aged 18 and over having outpatient treatment for suspected or confirmed low-risk PE have an agreed plan for monitoring and follow-up.

Finally, several principal recommendations from the 2019 National Confidential Enquiry into Patient Outcome and Death (NCEPOD) review, *Know the Score*, reinforced the above quality standards.[18] These included recommendations regarding administering anticoagulation when diagnostic investigation is delayed by >1 hour, the use of a validated risk score, assessing patients for suitability for ambulatory care and providing a follow-up plan and written information at discharge. In addition, they also recommended that:

- CTPA reporting should be standardised including the presence or absence of right ventricular strain.

Standards/Guidelines/Evidence Base

The below audit standards were derived from the key documents discussed above:

i. 2013 NICE Quality Standard 29; *Venous thromboembolism in adults: diagnosis and management*[16]
ii. 2018 BTS Guideline for the Initial Management of Pulmonary Embolism[14]
iii. 2019 NCEPOD Review*: Know the Score: a review of the quality of care provided to patients aged over 16 years with a new diagnosis of pulmonary embolism*[18]
iv. 2020 BTS Quality Standards for the Initial Management of Pulmonary Embolism[15]

In addition, the 2021 NICE Quality Standard 201; *Venous thromboembolism in adults* was also used in analysis of the data.[17]

Aims and Objectives

The aim of the audit was to assess whether patients treated as an OP for PE underwent timely investigation, adequate risk assessment and senior review and whether appropriate follow-up occurred. It also aimed to assess the presence and adequacy of a formalised OP pathway in a centre.

Methodology

All centres managing patients with acute PE in the UK were invited to take part. There were 2 parts to the audit:

Centre-level Organisational data

Each institution was asked to complete a single audit form which included organisational questions regarding the presence of a formalised pathway, access to 7-day CTPA, routine use of a validated risk stratification tool, the speciality/ies who managed patients on an OP pathway, the use of specific written information and short- and medium-term follow-up. This was titled as Outpatient Management of Pulmonary Embolism- Part 2 within the BTS audit system.

Patient-level data

Institutions were invited to identify and retrieve data for all patients diagnosed with an acute PE between 1st September – 31st October 2021 who met the following criteria:

- Attended and/or admitted to adult hospital services
- Presented with symptoms later diagnosed as due to PE
- Managed as an OP (discharged immediately or spent ≤1 night in hospital)
- Not diagnosed with an incidental PE on CT imaging performed for another reason
- PE did not develop during a hospital admission for another reason

Data entered for each patient included demographics, time to anticoagulation and imaging, use of risk stratification, biomarkers and clinical exclusion criteria, senior review and early follow-up. Case data were entered via the BTS online audit system on individual case report forms. No patient-identifiable information was submitted. This was titled as Outpatient Management of Pulmonary Embolism within the BTS audit system.

Results

Centre-level Organisational data

Eighty percent of centres have a formalised PE pathway while 73% of centres stated they had a 7-day service in place for OP management of PE. Ninety-two percent of centres have 7-day access to CTPA while 10% of centres do not have access to nuclear medicine scanning for patients unable to undergo CTPA.

Forty-six percent of centres stated they routinely used PESI (Pulmonary Embolism Severity Index) and 32% sPESI (Simplified Pulmonary Embolism Severity Index) while 17% of centres do not routinely use a validated risk assessment tool (Figure 1).

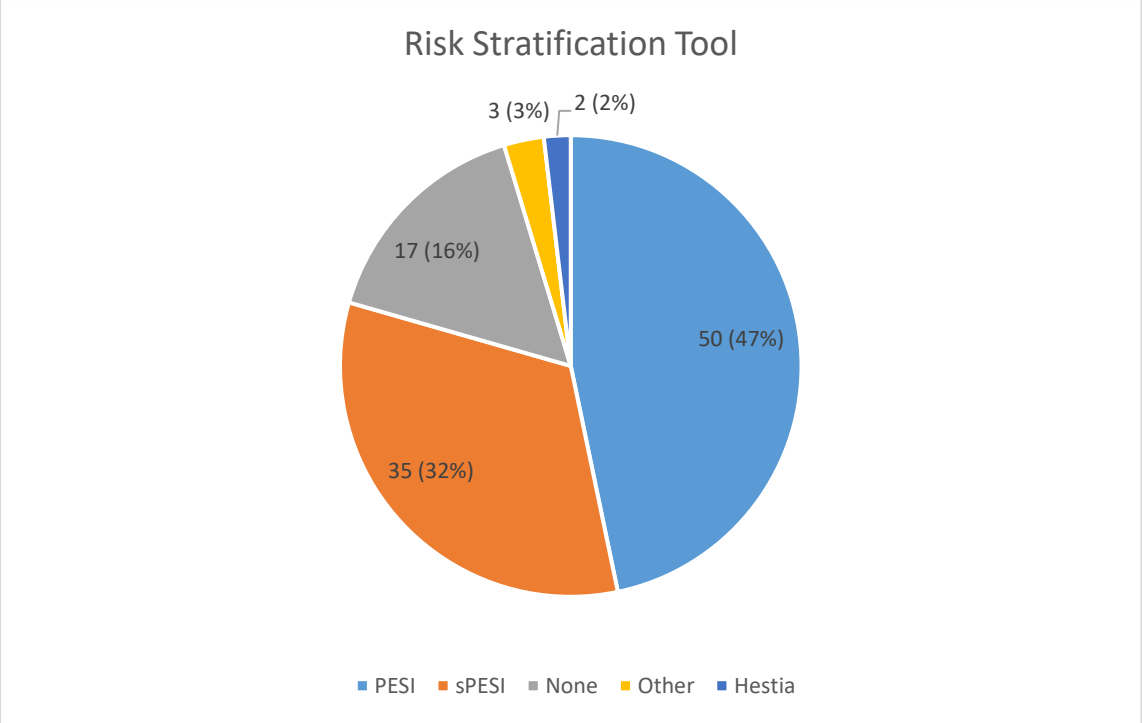

Figure 1: Risk stratification tool utilised at centres

Fifty-five percent of centres stated that patients receive specific written information while 66% of centres give emergency contact details to patients managed on an OP pathway. Formal follow-up within the 1st week following discharge occurs in only 31% of centres (Figure 2).

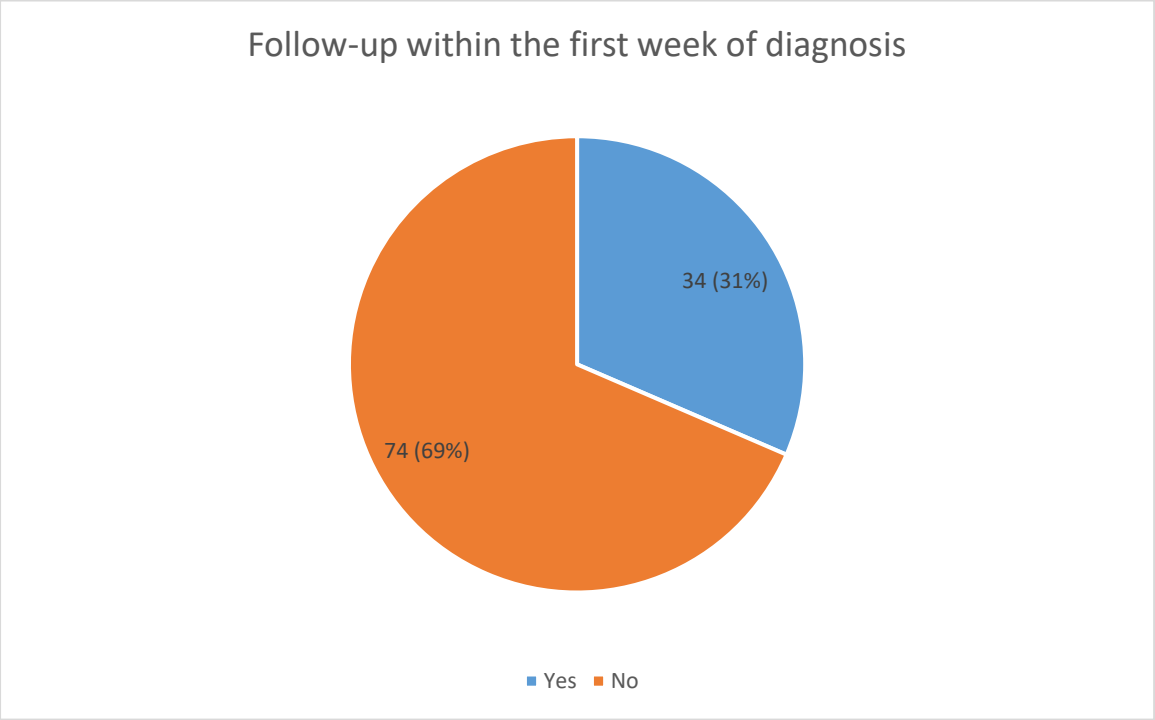

Figure 2: Proportion of centres who offer follow-up within 7 days of discharge

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Three-month follow-up occurs in 87% of centres, being in a respiratory clinic in 28%, haematology clinic in 17% and a combined clinic in 18% (Figure 3). This follow-up is in a dedicated PE clinic in 36% of centres.

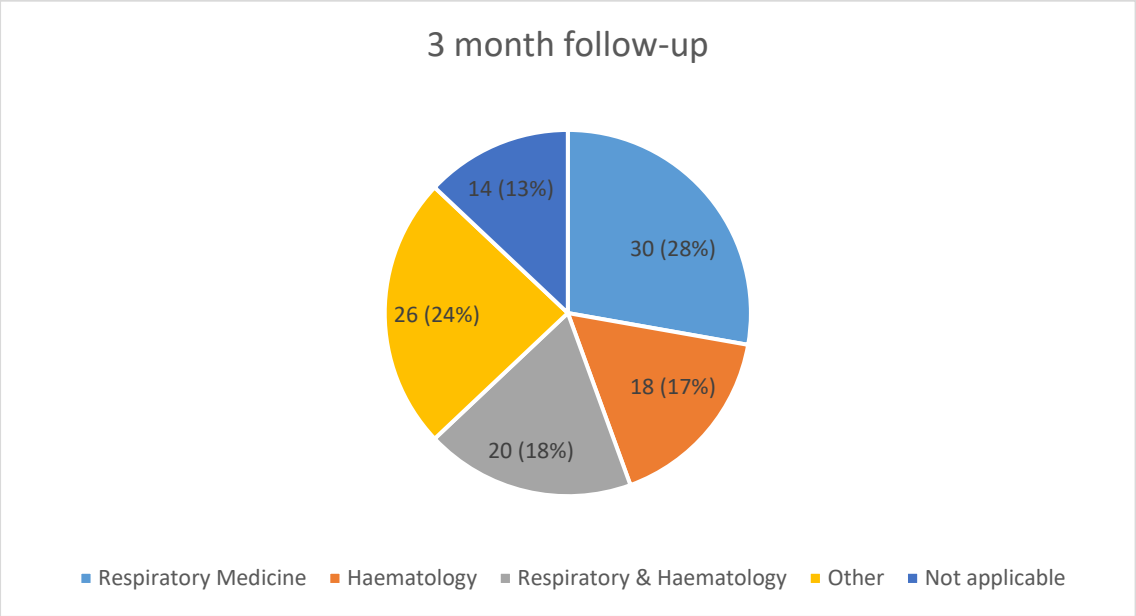

Figure 3. Three-month follow-up offered at centres

Patient-level data

Data for 1509 patients from 108 institutions was submitted. Ninety-one patients were not treated during the period of audit enrolment and so were excluded, leaving 1418 patients who underwent full analysis. Mean age was 57.9 ±18 years (45-73) with 51.2% of patients being female.

Initial Managing Team

The vast majority of patients were initially managed by either emergency department or ambulatory care/same day emergency care (Figure 4).

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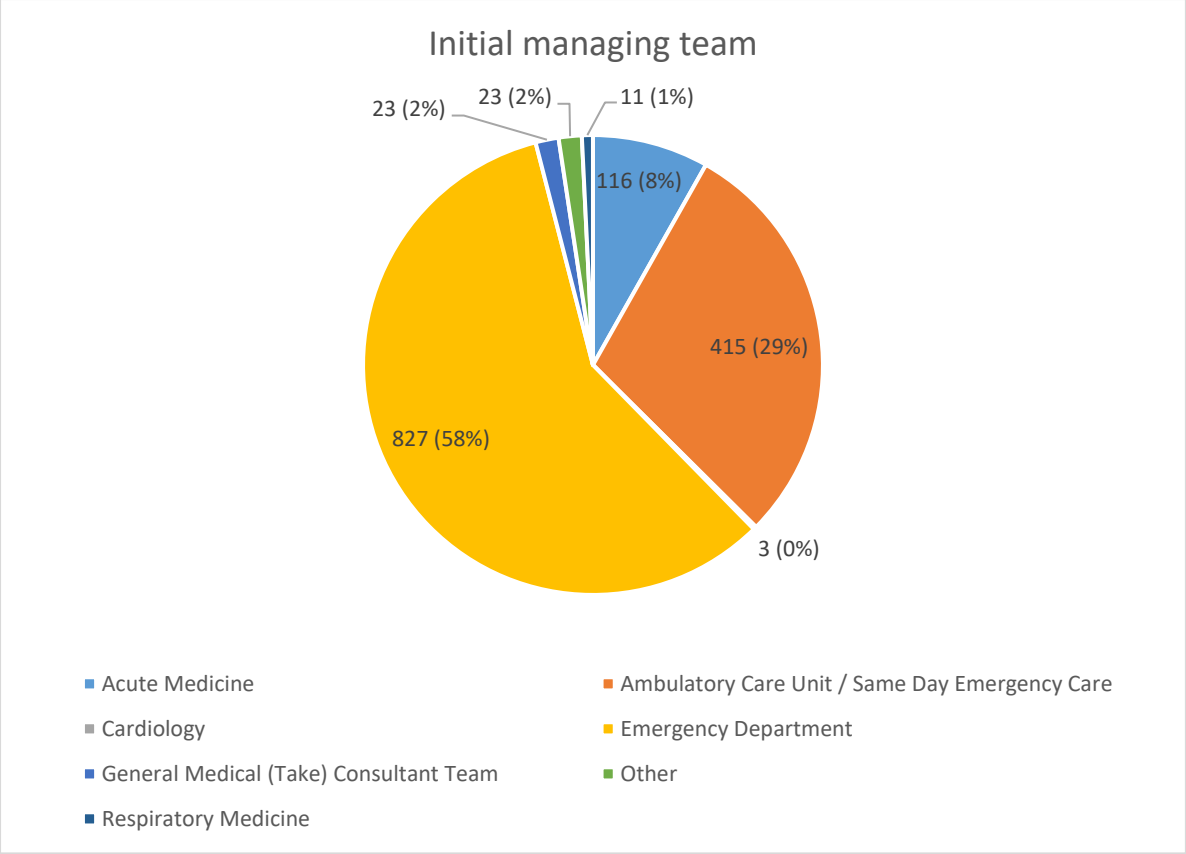

Figure 4: Initial managing team

Admitting Team

Fifty-three percent of patients were admitted for ≤1 night. Of these, 41% were admitted under ambulatory care/same day emergency care and 39% were admitted under acute medicine while 8% were admitted under the receiving general medical consultant, 4% under respiratory medicine and 1% under cardiology.

Imaging

Of 1348 patients with a documented response, 537 (40%) went home to return at a specific time for imaging. Of the total cohort of 1418 patients, the first diagnostic test was CTPA in 88%, nuclear medicine perfusion scan in 8%, compression ultrasonography in 1% and "other" in 3% (Figure 5).

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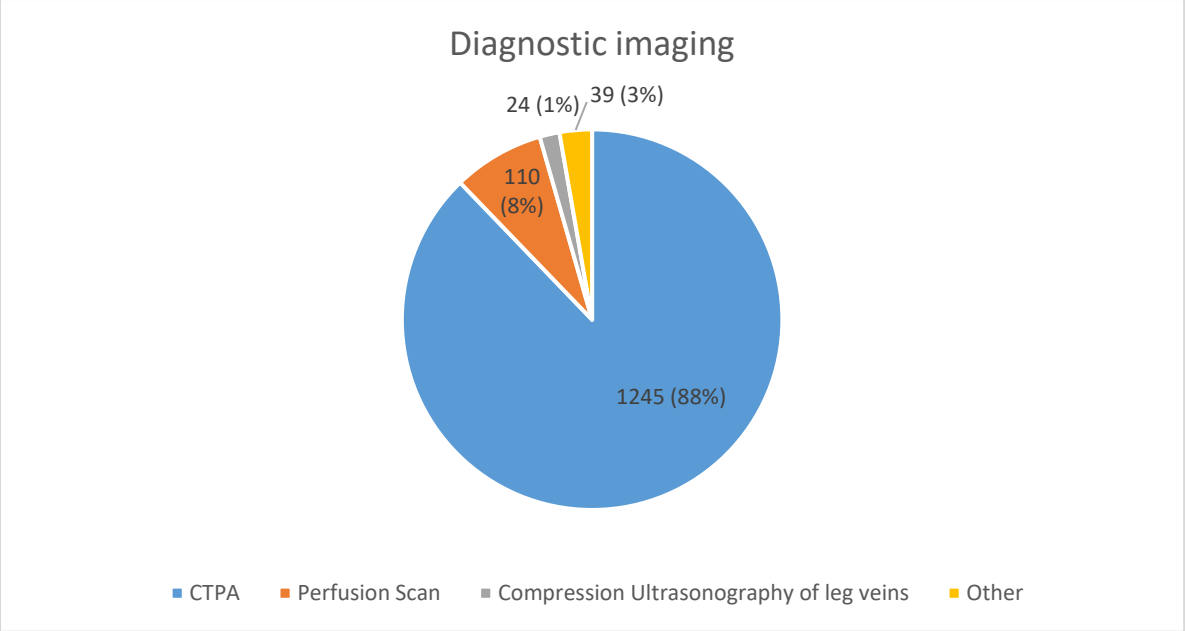

Figure 5: Diagnostic Imaging

Time between first clinical suspicion and first diagnostic imaging and initial anticoagulation

Twenty-six percent of patients did not undergo diagnostic imaging within 24 hours of first clinical suspicion of PE. Of the 1418 patients, the time from initial clinical suspicion to administration of therapeutic anticoagulation was not documented in 204. Of the remaining 1214 patients, diagnostic imaging was performed within 1 hour in 191 patients (16%). Of the 1023 patients whose diagnostic imaging was delayed by > 1hour, initial anticoagulation was not administered within the first hour in 48% (Figure 6).

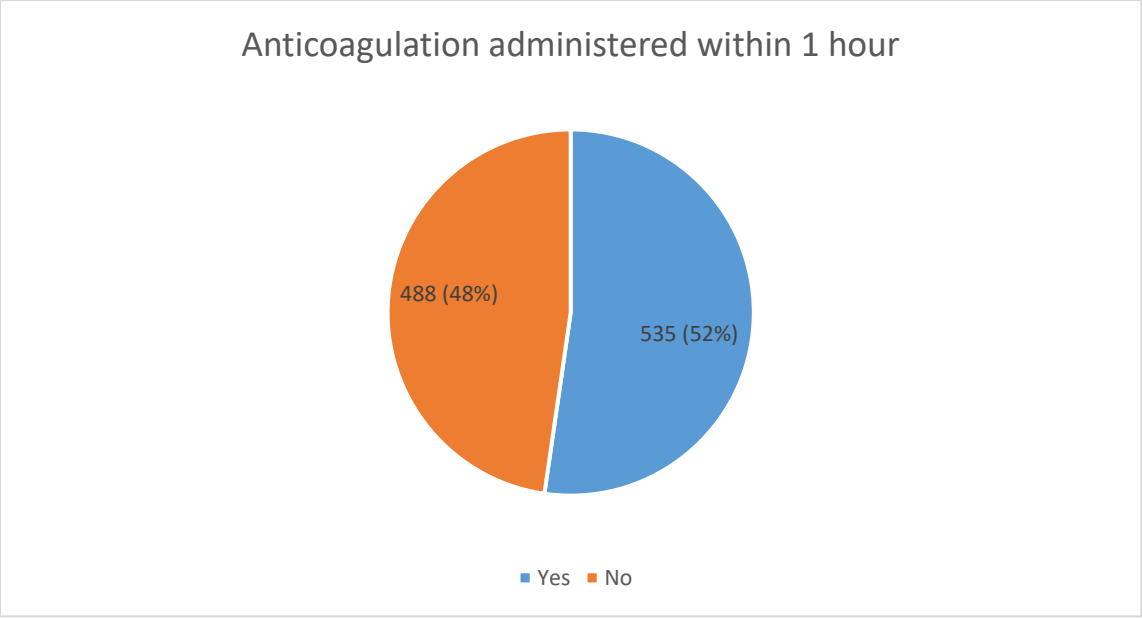

Figure 6: Proportion of patients whose diagnostic imaging was delayed by >1 hour who received initial therapeutic anticoagulation within the first hour.

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Risk stratification

Risk stratification is an essential part of the management of all patients with acute PE as it not only identifies patients at lower risk who may be candidates for OP management but also helps identify patients at higher risk who may require more intensive monitoring or management. Risk stratification was recorded as having been used in less than a quarter of patients, with the Pulmonary Embolism Severity Index (PESI) being the most frequently used tool (n=199, 14%) (Figure 7).

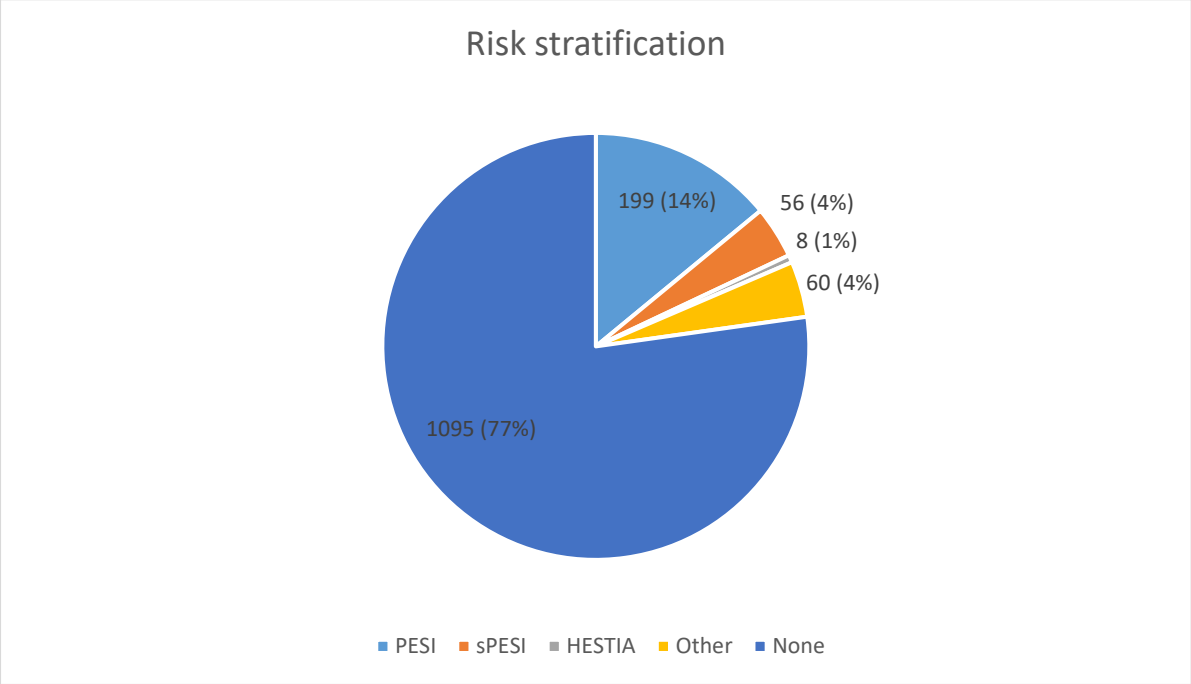

Figure 7: Risk stratification

The BTS OP PE guidelines recommend considering OP PE management in patients with PESI score of I or II or a simplified PESI (sPESI) score of 0.[14] Thirty-three patients had an unclear/invalid PESI score. Out of the remaining 166 patients, 24 had a PESI score of III, 4 a score of IV and 1 patients had a score of V, meaning that 17% of patients with a valid PESI score did not meet PESI criteria for outpatient management. Fifty-four patients recorded as having undergone the sPESI had a recorded score. Twelve patients (22%) had a sPESI score of >0 meaning that they also did not meet PESI criteria for outpatient management.

Right ventricular (RV) assessment was recorded in the notes in 58% of cases, with CTPA alone being used to assess the RV in 53% of cases and echocardiography in 5% of cases. Data regarding the use of a laboratory biomarker in patients with evidence of a dilated RV on CTPA and/or echocardiography was very incomplete (Figure 8).

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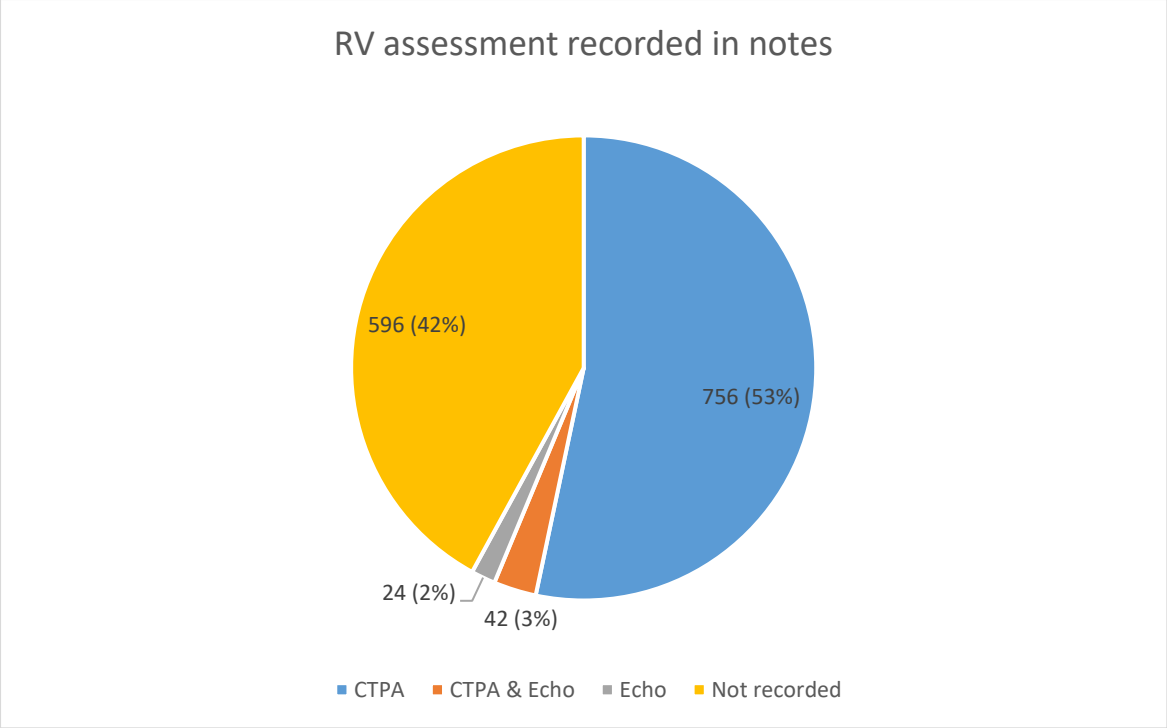

Figure 8: Assessment of RV strain recorded in notes

Clinical exclusion criteria were recorded as having been assessed in 216 patients (15% of the total number of patients), however due to incomplete completion of this question, the true denominator is not known.

Anticoagulation

Direct oral anticoagulants were used in 76% of patients, with agents not requiring pre-loading with low molecular weight heparin (apixaban and rivaroxaban) being the most commonly prescribed (Figure 9).

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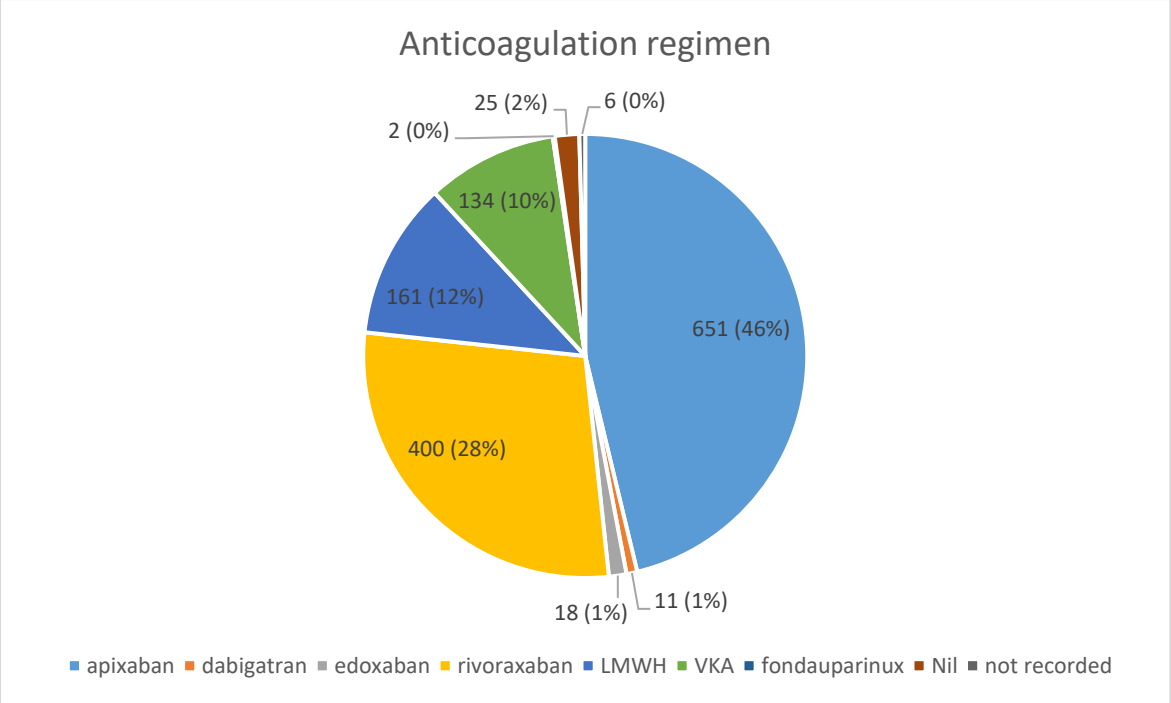

Figure 9: Anticoagulation regimen

Discharge and follow-up

Ninety-one percent of patients were reviewed by a senior decision-maker (ST3 or above (ST4 in emergency medicine), staff grade or similar substantive career grade doctor, advanced nurse practitioner or clinical nurse specialist designated to undertake this role within the department with consultant advice available) before going home on an out-patient pathway (Figure 10).

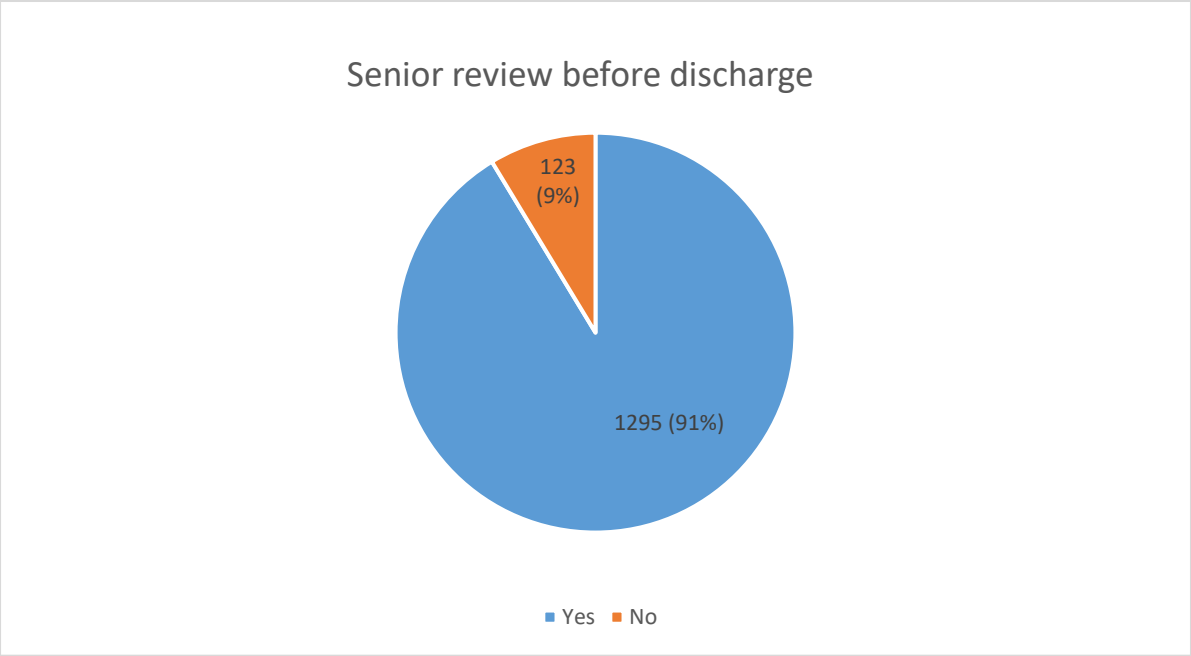

Figure 10: Proportion of patients who underwent senior review before going home

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Written information was recorded as having been administered in 40% of patients. Follow-up within 7 days of discharge on an out-patient pathway occurred in 38% of patients, did not occur in 50% and was not recorded in 12% (Figure 11).

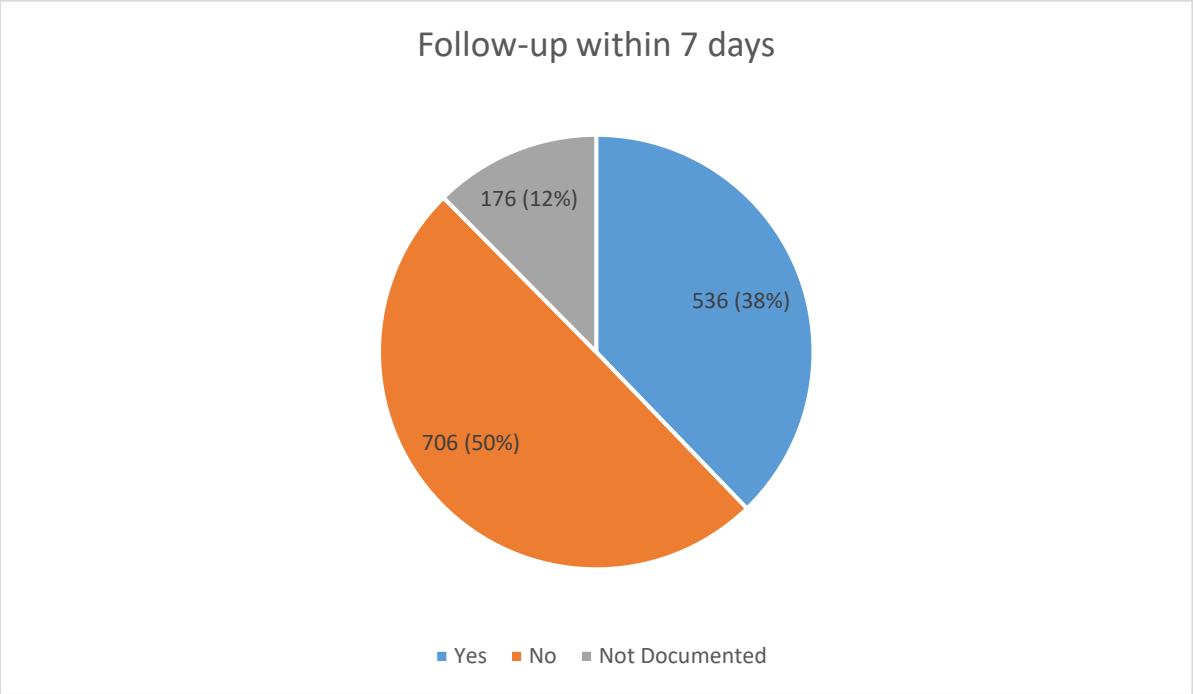

Figure 11: Proportion of patients who received follow-up within the first week following discharge

Conclusions/Observations

This is the first BTS audit of OP PE management. It provides an insight into current practice in the UK including areas for improvement in care when compared with best practice as defined by clinical guidelines and quality standards. Its results therefore will act as a benchmark against which future audits can demonstrate whether progress has been made over the ensuing years.

The main findings are:

1. 80% of centres have a formalised OP PE pathway.
2. 92% of centres have 7-day access to CTPA.
3. In patients whose diagnostic imaging was delayed by > 1hour, initial anticoagulation was not administered within the first hour in 48% of patients.
4. 26% of patients did not undergo diagnostic imaging within the first 24 hours.
5. Risk stratification using a validated tool was recorded in the notes in only 23% of patients.
6. 17% of patients assessed with PESI and 22% of patients with sPESI had a risk score >very low/low and should therefore not have been suitable for OP management.
7. The presence or absence of RV strain was recorded in the notes in 58% of cases.
8. 91% of patients were assessed by a senior decision-maker prior to going home.
9. Written information was recorded as having been given in only 40% of patients.
10. Initial follow-up within 7 days of discharge occurred in only 38% of patients.

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11. 87% of centres offer 3-month follow-up.

There are a number of encouraging findings from the audit. First, 80% centres have a formalised OP PE pathway with access to 7-day CTPA in 92% of trusts. The remaining 20% of centres should be encouraged to develop an OP pathway before the next audit occurs. Second, 91% of patients were reviewed by a senior decision-maker prior to going home. This is an important safety step in an OP pathway and helps ensure that the diagnosis is correct and that the patient is suitable for OP management. Third, 87% of centres provide routine 3-month follow-up which is important for assessing longer-term anticoagulation needs, resolution of symptoms and to ensure that an initial limited screen for malignancy has been performed (although this latter aspect should ideally be undertaken earlier in the pathway).

There were, however, a number of findings of the audit which require improvement. Most notably, recording of a risk stratification score was only present in 23% of patient notes. Furthermore, around a fifth of patients who did undergo PESI and sPESI had a score suggestive of being at moderate/high risk of deterioration which would not qualify them for OP management. Although 83% of centres stated that a risk tool is used in their institution, the patient-level data suggests that in practice risk stratification is infrequently performed and that it is quite often not acted on appropriately. Risk stratification is an essential part of PE management as it not only identifies patients at lower risk who may be candidates for OP management but also informs management in patients with more severe disease.[19]

Second, almost a half of patients who did not go for “immediate” diagnostic imaging did not receive an initial dose of anticoagulation within 1 hour. This is an important recommendation of NICE and NCEPOD which aims to reduce the risk of clinical deterioration in patients with acute PE while waiting for diagnostic imaging.

Third, the presence or absence of RV strain was recorded in just over a half of patients. This may be explained by somewhat conflicting advice. The BTS OP PE guidelines state that assessment of RV strain on CTPA is not obligatory in identifying low-risk patients suitable for OP management.[14] If RV dilatation is noted then those guidelines do suggest measurement of a biomarker (troponin or NT-proBNP/BNP) to identify patients suitable for discharge. Conversely, the current ESC PE guidelines suggest that RV dilatation should be a contraindication to OP measurement.[20] Of note, the presence or absence of RV dysfunction did not affect the ability of the Hestia criteria to identify patients at low risk of complications, while the 25% of patient in the recent HOME-PE study comparing s-PESI and HESTIA in an outpatient setting who had RV dysfunction did not experience any adverse clinical outcomes.[6, 21] Nevertheless, NCEPOD have recommended routine assessment of the presence or absence of RV strain on CTPA in patients diagnosed with acute PE and recording of this information should be encouraged.

Fourth, written information was recorded as having been given in only 40% of cases, while written information is available in only 2/3 of centres. Furthermore, initial follow-up within 7 days occurred for just 38% of patients. Adequate patient information including contact details and early follow-up are vital to ensure that a patient who has only had a short hospital attendance understands their diagnosis and that any concerning features in their recovery are identified.

Limitations

Data regarding adverse outcomes to patients managed as an OP, including readmission and mortality, were unfortunately not recorded. Data regarding the use of clinical exclusion criteria and the use of biomarkers in the case of RV dysfunction were incompletely completed.

National Improvement Objectives:

1. A validated risk stratification score should be recorded in the notes of all patients managed on an OP PE pathway. **Target 90%**
2. Initial anticoagulation should be administered within 1 hour of clinical suspicion of PE, unless diagnostic investigations occur within the first hour. **Target 90%**
3. All patients should receive written information including emergency contact details and follow-up within 7 days of going home. **Target 90%.**

Timeline: 18 months from report publication.

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