Clinical Guideline

INVESTIGATION AND MANAGEMENT OF PULMONARY EMBOLISM

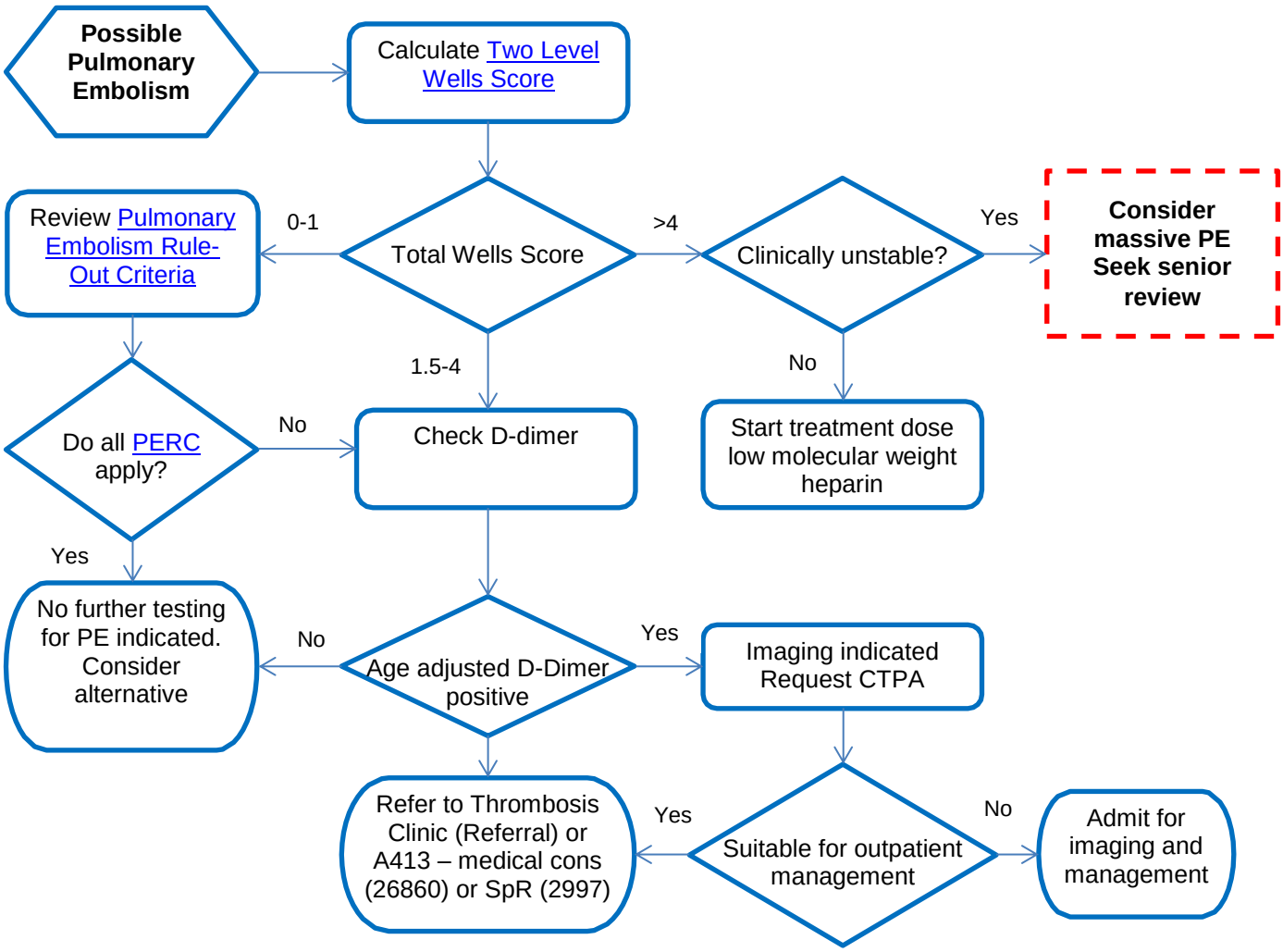
SETTING	Trust-wide
FOR STAFF	Medical and nursing staff
PATIENTS	Adult patients with suspected or confirmed pulmonary embolism Excludes pregnancy and puerperium (see http://nww.avon.nhs.uk/dms/download.aspx?did=11244)

Guidance

This guideline consists of three sections: Investigations for suspected PE; immediate management of confirmed PE; continuing management of confirmed PE. Clinical judgement should always be used when deciding on management for individual patients.

1. Investigations for suspected PE in ED/inpatients*

(Underlined text links to explanatory paragraphs below)



* Patients referred from primary care with suspected PE will be discussed with medical consultant (in hours) or SpR (OOH), and seen directly on A413.

Two Level Wells Score

Criterion	Score
Clinical signs of deep vein thrombosis (leg swelling or pain on palpation)	3
Pulmonary embolism is more likely than alternative diagnoses	3
Heart rate >100 beats per minute	1.5
Immobilisation for more than three days or surgery in the previous 30 days	1.5
Previous deep vein thrombosis or pulmonary embolism	1.5
Haemoptysis	1
Malignancy (on treatment, treated within the last 6 months)	1

Interpretation of Two Level Wells Score:

Total	Probability of PE	Interpretation
≤ 4.0	3%	PE unlikely (if score 0 or 1.0 see below for rule out
>4.0	28%	PE likely

Pulmonary Embolism Rule Out Criteria (PERC)

If Wells score is 0 or 1.0 and all of the following apply the patient is at ultra-low risk of pulmonary embolism:

- Age < 50 year old
- Heart rate < 100 beats/min
- SpO2 > 94%
- No unilateral leg swelling
- No haemoptysis
- No surgery or trauma within last 4 weeks
- No previous deep vein thrombosis or pulmonary embolism
- No current oral hormone use

No further investigations (including D-dimer) are indicated. Consider an alternative diagnosis to PE.

Outpatient management suitable if meets the following criteria:

- Haemodynamically stable – HR <110, systolic BP >100mmHg, no requirement for inotropes, thrombolysis or embolectomy
- Not requiring supplementary oxygen (Sa ≥94%, except those with chronic respiratory disease (88-92%)
- None of the following contraindications to anticoagulation:
    - Active bleeding or risk of major bleeding (e.g. recent GI bleed or surgery, previous intracranial bleeding, uncontrolled hypertension)
    - History of heparin induced thrombocytopenia (HIT) previously (if LMWH is to be used as the out-patient treatment)
    - Chronic kidney disease (CKD) stages 4 or 5 (eGFR<30ml/min) or severe liver disease
    - Already on anticoagulation at the time of the suspected/confirmed PE
- No evidence of right heart strain, as evidenced by:
    - New or unexplained elevated troponin (>14ng/l)
    - ECG showing right heart strain
    - CTPA (if already done) showing evidence of right heart strain
- No other social concern or medical condition warranting admission

Patients with a confirmed diagnosis of pulmonary embolism who are thought suitable to be discharged should be assessed by a senior clinician (ST3 or above) prior to discharge. They should be given clear instructions on what to do if their condition deteriorates.

Imaging

- Clinical probability +/- D-dimer result required on scan request
- CTPA first line investigation
- V/Q scan recommended for women of childbearing age but do not delay scanning if unavailable
    - If leg symptoms present can request Doppler ultrasound to make diagnosis, if leg scan positive for VTE chest imaging not indicated
- All women of childbearing potential require a pregnancy test
- If delay in imaging and PE likely by Wells score will need treatment dose anticoagulation

2. Immediate management of confirmed PE

(Underlined text links to explanatory paragraphs below)

Shock or hypotension (persistent SBP<90mmHg despite fluid)

RV dysfunction or myocardial injury

Massive PE

High risk: >15% in hospital/30 day mortality

Thrombolysis
Consultant/ST3+ input required

Contraindications:

- Active bleeding
- Major surgery or serious trauma within last 14 days
- Clinical diagnosis of subarachnoid haemorrhage even if CT normal
- Caution and careful assessment of risk benefit IF:
  - Treatment dose low molecular weight heparin within 24 hours
  - On treatment with an oral anticoagulant (rivaroxaban, apixaban, edoxaban, dabigatran, or warfarin)

ALTEPLASE*
10mg (10mL) IV bolus over 1-2min
Followed by IV infusion 90mg over two hours (max total bolus + infusion 1.5mg/kg in patients <65kg)

Alteplase is kept in ED, A515, ITU and CCU

+ UNFRACTIONATED HEPARIN INFUSION (see notes below)

Admit to CCU/ICU/HDU/ Resp High Care with cardiac monitoring
Prescribe low molecular weight heparin for minimum of five days as inpatient

Sub-Massive PE

Intermediate risk: 3-15% in hospital/30 day mortality

ANTICOAGULATION
ENOXAPARIN low molecular weight heparin 1mg/kg BD
OR
Unfractionated heparin if high risk of bleeding or renal impairment (eGFR <30mls/min). See Trust protocol

Monitor closely for shock or respiratory failure (to consider thrombolysis – discuss with senior)
Check troponin +/- BNP if abnormal ECG or RV dilatation on CT

Non-Massive PE

Low risk: <3% in hospital/30 day mortality

ANTICOAGULATION
Routine management with

APIXABAN
10mg BD for seven days, then 5mg BD thereafter
OR
RIVAROXABAN
15mg BD for three weeks, then 20mg OD thereafter

If still inpatient – consider outpatient management

Refer all patients to Thrombosis Nurses within 24 hours

Markers of right ventricular (RV) dysfunction or myocardial injury suggesting sub-massive PE:

- **ECG:** T wave inversion V1-V3, new right axis deviation, RBBB, S1Q3T3
- **CTPA:** RV dilatation
- **Raised troponin or BNP**

3. Thrombolysis of massive PE

Thrombolysis is indicated for acute PE with cardiogenic shock, i.e. BP <90mmHg despite fluid resuscitation and/or evidence of compromised organ perfusion, or in cardiac arrest.

Alteplase comes in 50mg vials with 50ml sterile water diluent; 2 full bottles (100mg) will be required unless the patient weighs <65kg, in which case the total dose (bolus dose + infusion dose) will be 1.5mg/kg.

10mg (10ml) is administered as a bolus dose IV over 1-2minutes, followed by a 2 hour infusion of the remaining 90mg (90ml) alteplase via a syringe pump (or the remainder of the dose if the patient is <65kg).

Heparin infusion

After completion of the alteplase infusion:

a) Check APTT level immediately after completion of the alteplase infusion
b) Initiate unfractionated heparin infusion as per UH Bristol IV heparin guidelines three hours after administration of alteplase, **providing APTT levels are less than 64 sec** (twice the upper limit of normal). A bolus dose should be given if heparin is being initiated.
c) Once the patient is stabilized consider alternative anticoagulation therapy

Patients who have been thrombolysed should be nursed on CCU or other high-dependency area (ITU).

4. Continuing management of confirmed PE

Refer to Thrombosis Specialist Nurses within 24h of diagnosis

- Provide counselling for anticoagulation decisions
- Facilitate discharge and provide initial follow up
    - Phone extension 24684: Mon-Fri 9am- 5pm & Sat-Sun 9am-12pm
    - Complete referral from on http://nww.avon.nhs.uk/dms/download.aspx?did=12441

Anticoagulant Choice

Apixaban 10mg BD PO for seven days, then 5mg BD thereafter
OR
Rivaroxaban 15mg BD PO for 21 days, then 20mg OD thereafter
OR
Enoxaparin 1mg/kg BD SC for a minimum of five days with conversion to **Warfarin**

NB if using Enoxaparin recommended dose in symptomatic PE or where there are risk factors (e.g. malignancy) is now 1mg/kg BD initially

Duration of anticoagulation

- Provoked PE (i.e. secondary to **major** temporary risk factor): three months
- Unprovoked PE: minimum three months but consider long-term
- Pulmonary hypertension at three months: long-term anticoagulation
- Special circumstances:
    - IVDUs – Rivaroxaban is a good choice
    - Pregnancy – Enoxaparin 1.0mg/kg SC BD
    - Known active malignancy – Enoxaparin 1mg/kg SC BD initially with potential to reduce to 1.5mg/kg if symptoms improve
    - Initial period of anticoagulation three to six months; reassess need for further anticoagulation at six months
        - Check platelet count at seven to 10 days

Investigation for underlying malignancy (to be arranged by the admitting medical team)

Occult malignancy is found **in less than 5%** of patients with an apparently unprovoked pulmonary embolism

- Thorough history and physical examination (incl. rectal and breast exam)
- FBC, LFTs, Calcium, PSA
- Urinalysis
- **CT abdomen/pelvis is not routinely recommended**; consider only when there is clinical suspicion based on history, examination, and abnormal blood tests. Occult malignancy is rare in under 40s where careful consideration should be given to radiation exposure. Again, consider mammogram +/- cervical screening according to history.

Choice of investigation should be guided by clinical presentation

Echocardiogram

Not indicated in the acute setting unless suspected massive PE and CTPA inappropriate or contraindicated.

Even if CT suggests right heart strain, an ECHO at this stage does not change management. If persistent dyspnoea at three months:

- Consider transthoracic echocardiogram
- Refer to respiratory: type '*goto/chest*' into the intranet/bleep 6059

Discharge Planning

Patients requiring hospital admission – recommended admission minimum 48hrs

- **Prior to discharge they should be reviewed by a senior clinician (ST3 or above)**

Consider the following parameters to be safe for discharge (taking into consideration their pre-morbid condition):

- RR ≤20
- BP >100 systolic
- HR <100
- $Sa0_2$ ≥94% on air (i.e. not requiring oxygen)
- No undue dyspnoea on walking

The patient should be counselled regarding what to expect (i.e. that recovery may take some weeks) and that they should seek medical advice if still breathless at three months.

A patient information leaflet for patients has been written; a copy of the text is appended to this guideline.

Follow up

Haematology clinic → unprovoked PE in patients who are otherwise well at discharge:

- Primarily for discussion of longterm anticoagulation
- Also consider for young patients with >1 first degree relative with VTE and
- Post-partum follow up of all patients with PE during pregnancy

Respiratory clinic → patients with sub-massive PE, evidence of pulmonary hypertension, abnormal echo, or underlying lung disease

GP follow up only → provoked PE in patients who are otherwise well. The GP needs to assess for ongoing breathlessness at three months (and subsequent respiratory referral); this must be made clear in the discharge paperwork.

REFERENCES	1. British Thoracic Society Guideline for the initial outpatient management of pulmonary embolism. Thorax, 2018 73:S2 2. Venous thromboembolic diseases: the management of venous thromboembolic diseases and the role of thrombophilia testing NICE Clinical guideline 144 2012 3. Pulmonary Embolism: NICE clinical knowledge summary. https://cks.nice.org.uk/pulmonary-embolism#!topicSummary
RELATED DOCUMENTS AND PAGES	None
AUTHORISING BODY	Thrombosis Group
SAFETY	None
QUERIES AND CONTACT	Thrombosis Nurses (ext 24684)

Discharge advice after a pulmonary embolism

After being diagnosed with a pulmonary embolism (PE) – a blood clot in the lungs – you will be discharged when appropriate with anti-coagulant medication (medicine to thin your blood).

This can be in the form of tablets or injections, and may be for a short defined period or for long-term use – all depending on what is the best option in your case.

This leaflet provides you with information on what to expect and what to watch out for once you are home.

Treatment for pulmonary embolism

Treatment for PE aims to stop new clots from forming, and to prevent long-term complications from the clot. Blood thinners do not dissolve the clots themselves, but prevent the clots from getting any bigger while the body breaks the clots down by itself.

To ensure that you get better it is very important that you:

- **Take your medication regularly as prescribed – don't skip any doses**
- Get up and move around as your condition allows – it is important not to sit or lie still for long periods of time

Other things that you can do to prevent problems in the future include:

- Stopping smoking
- Staying at a healthy weight
- Exercising regularly as you are able

What to expect

When you are discharged from hospital, the team looking after you will have told you what follow-up arrangements are needed in your case, and how long you should take your blood thinning medicine for. **If you have any questions regarding this, please ask us before going home.**

Depending on how large your clot is, you may need to be seen by the respiratory (chest) medicine team after going home. This is to check that larger clots have dissolved fully, and have not caused any longer-term problems.

You may also need to see the haematology (blood) team. This will be to decide if your blood thinning treatment needs to continue longer term.

Some patients also require further scans after going home, either to look for causes of the clot, or to look at how well the heart is working with the clot. Your team will tell you about these scans if they are necessary in your case.

Things to watch out for:

1. **Bleeding**

All blood thinners are associated with a small risk of bleeding. You may notice that you bleed for longer than usual when you cut yourself, so take care when shaving and using sharp instruments. Do not play any contact sports.

Watch for bleeding and bruising whilst taking these medicines, for example bleeding gums or blood in the urine or bowel movements. If your bowel movements become black and tarry this can be a sign of bleeding. You should seek medical advice if you experience bleeding like this.

If you need any procedures at the dentist, or any other operation, you should tell the healthcare staff treating you that you are on blood thinners. You should also tell anyone who is prescribing you a new medicine that you are on blood thinners, in case it interacts with them.

2. **If things aren't getting better**

Because the body breaks down the clots by itself, it can take some time (several weeks) for all of your symptoms to clear and for you to feel completely better again – this is normal.

However, sometimes blood thinning treatment doesn't work, and the clot doesn't fully dissolve. This puts extra strain on the heart, which can cause long-term problems if it isn't spotted.

If you still feel breathless after 3 months of treatment it is very important that you seek medical advice. If this is the case, either your GP or your treating doctor can organise a heart scan and an appointment to be seen in our respiratory (chest) clinic.

3. **If you feel worse**

If your symptoms are getting worse rather than better, or if the symptoms of a clot come back again after going away, you should seek urgent medical advice.

If you have questions

If you have questions about your condition or treatment, you can obtain advice from either:

- Your GP
- Your local pharmacist
- The thrombosis team at Bristol Royal Infirmary
- The team who treated you when you were admitted

The telephone number for Bristol Royal Infirmary is 0117 923 0000, where you can ask to be put through to the appropriate team.