Whittington Health NHS

Pulmonary Embolism
Diagnosis & Management

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Target Audience:	All medical and nursing staff involved in the care of patients with suspected VTE
Key Words:	VTE, pulmonary embolism (PE), deep vein thrombosis (DVT)

Version Control Sheet

Version	Date	Author	Status	Comment
2.0	14.11.14	Rizwan Kaiser, Alison Thomas, Farrukh Shah		Update from 2010 guideline • New Algorithms on investigation pathway, management of haemodynamically stable and haemodynamically unstable patients • New section on Risk Stratification and Submassive PE • Updated text in anticoagulation section • New section VTE causality, Duration of anticoagulation, Screening for occult malignancy, and follow up arrangements

➢ Criteria for use

➢ This guideline is for use only on **NON-PREGNANT ADULT PATIENTS** with suspected pulmonary embolism or deep vein thrombosis.

Please see Whittington Hospital NHS Trust Guideline
"Venous Thromboembolism in Pregnancy and the Puerperium: Acute Management."

➢ Introduction

Guidelines for the management of suspected acute pulmonary embolism (PE) are based on NICE guidance published in 2012 [1] and European Society of Cardiology [2]

The diagnosis and management of PE consists of a number of stages:

- Establishing a diagnosis:
  - Clinical evaluation and pre-test probability score (Wells score)
  - D-dimer for diagnosis exclusion in low risk patients
  - Imaging to confirm diagnosis (V/Q scan or CTPA)
- Risk stratification to determine management location (inpatient vs. outpatient) and treatment escalation in massive and sub-massive PE
- Immediate therapy: initiation of heparin anticoagulation
- VTE classification (provoked vs. unprovoked vs. cancer-related) and longer term management.

➢ Risk Factors for PE

PROVOKING	***OTHER:***
Active cancer or receiving cancer treatment	Previous VTE or family history of VTE
Surgery within past 12 weeks	Obesity (Body mass index >30kg/m^2)
Hospitalisation within past 12 weeks	Known thrombophilia
Pregnancy or recent childbirth	Medical co-morbidities including: heart disease, lung disease, inflammatory disorders, metabolic/endocrine disorders
Hormone replacement therapy or oestrogen containing contraceptive	Sickle cell disease or thalassaemia
Intravenous drug use	Nephrotic syndrome
Central venous catheter (in situ or recent)	Varicose veins with phlebitis
Lower limb fracture/ immobilisation	
Immobilisation >3 days	
Long distance travel >4 hours	

➢ Is VTE likely?

The following must be considered during clinical assessment:

- Presenting features suggestive of PE
- Is there another diagnosis that may account for the symptoms/signs? E.g.
  - Pneumonia, cardiac failure, pneumothorax, exacerbation COPD, myocardial infarction, pericarditis

➢ Presenting features of PE

PE classically has several patterns of presentation: -

- Sudden circulatory collapse with acute right heart failure, in a previously well patient or in a patient with poor cardiorespiratory reserve (15%)
- Pulmonary infarction syndrome i.e. pleuritic chest pain & haemoptysis (60%)
- Isolated breathlessness (25%)

97% patients with PE will have ≥ 1 of dyspnoea/tachypnoea/pleuritic chest pain.

The overall predictive value of any single clinical feature in the diagnosis or exclusion of PE is less than 80% [3]. The commonest symptoms and signs are:-

Symptoms		**Signs**	
Breathlessness	73%	Tachypnoea ≥ 20/min	70%
Pleuritic chest pain	66%	Crackles	51%
Cough	20%	Tachycardia ≥ 100/min	30%
Haemoptysis	11%		

Less common signs include: Wheeze, pleural rub, 4th HS, Loud pulmonary 2nd HS, pyrexia

➢ Basic initial tests for suspected PE

- ABG on air if O_2 Sats < 94% (note O_2 Sats may be in normal range in young healthy adults
- ECG – commonest finding sinus tachycardia, look for changes of R heart Strain : S1 Q3 T3 pattern, anteroseptal T wave inversion or ST depression, RBBB
- CXR to look for alternative cause. In PE often normal, but the following may be seen :
  - Linear/wedge shaped shadows
  - Small pleural effusion (80% exudates, 20% transudates)
  - Localised subtle paucity of vasculature
- Troponin T – may be elevated in acute PE (correlates with increased short term mortality and risk of adverse outcome) [4]
- Pregnancy test: must be performed in all women of childbearing age. If positive refer to separate guideline relating to VTE diagnosis and management in pregnancy.

➢ Clinical Probability Scoring – 2 level Wells score

Two-level PE Wells Score [5]	
Criterion	Points
Clinical signs of DVT (i.e. leg swelling, pain)	+3
Alternative diagnosis **less likely** than PE	+3
Heart rate > 100/minute	+1.5
Immobilization (>3 days) or surgery < 4 weeks ago	+1.5
Previous DVT or PE	+1.5
Haemoptysis	+1
Cancer	+1

Total score

- 4 points or less : PE unlikely
- > 4 points : PE likely

➢ D-dimer in diagnosis of PE

D-dimers are breakdown products from fibrinolysis and are raised in a number of circumstances including active thrombosis, disseminated intravascular coagulation, inflammation, cancer and pregnancy.

They are only useful for EXCLUSION of PE in patients already deemed to be at low risk clinically using the Wells score i.e. : 4 points or less (PE unlikely score)

- D-dimer should not be performed if :
  - PE Wells clinical probability score > 4 (PE Likely score)
  - Inpatients, pregnancy, sickle cell patients with vaso-occlusive crisis. These patients should proceed directly to imaging.

- Negative D-dimer test reliably excludes PE in patients with **low clinical probability score**. Further tests for PE (VQ or CTPA) are not indicated.

D-dimer goes in a citrate bottle (**light blue top**).

➢ Chest x-ray (CXR)

- Good quality PA CXR should be obtained.
- Aim to get a formal review of CXR by a radiologist. Within working hours review by hot seat radiology. Outside of working hours, CXR must be reviewed by a senior clinician (registrar grade or above)
- Look specifically for other diagnoses i.e. pneumonia, pneumothorax, heart failure, features of chronic airflow obstruction (e.g. hyperinflation).

➢ VQ or CTPA

VQ should be considered 1st line if any of:

- Age < 40 years and provided CXR is normal & no history of chronic respiratory disease
- History of contrast allergy
- Severe renal impairment

CTPA should be considered 1st line if any of:

- Age > 40 years
- Abnormal CXR or history of chronic respiratory disease
- Any age and massive or submassive PE suspected (haemodynamic instability and/or severe hypoxaemia)

Definitive investigation for PE **must occur within 24 hours** of presentation, ideally the same day. Within working hours arrange test via radiology hot seat.

- VQ available Monday - Friday only – MUST INFORM NUCLEAR MEDICINE (x5517) BY 12 pm FOR POSSIBLE SAME DAY VQ SCAN.

- Weekends – CTPA only available, unless patient presents on a Sunday and can wait for VQ on Monday (discuss with radiologist on call).

- If out of hours and/or same day scan not possible - if patient is suitable for ambulatory care with no exclusion criteria (see ambulatory care pathway), then patient can be treated with LMWH and return to Ambulatory Clinic for next day scan and review. See Ambulatory Care Pathway Guideline on intranet.

- Treat patient with LMWH whilst awaiting imaging, unless imaging to be performed within 1 hour of patient's presentation.

A normal VQ scan and good quality negative CTPA exclude PE. However, if there is discordant very high clinical probability and no alternative cause for symptoms, then further imaging may be indicated. If there is clinical suspicion of DVT then perform leg Dopplers initially. Discuss all such cases with Thoracic Radiology Consultant and Respiratory Consultant.

Pulmonary Embolism – Investigation Pathway

Clinically suspected Pulmonary Embolism
→ Breathlessness ± Pleuritic chest pain ± Haemoptysis

If hypotensive, and massive PE suspected – Urgent CTPA or portable ECHO (if not clinically stable for transfer to CT)

History/Examination/ ECG/ CXR
Bloods (FBC, U&E, CRP, Clotting, Trop T +/- ABG

Assess Clinical Probability (2 Level Wells Score)

PE unlikely (≤ 4 points)

PE likely (>4 points)

Check D-dimers

D-dimer -ve

D-dimer +ve

PE excluded
Consider alternative diagnoses

Give treatment dose LMWH (Tinzaparin 175 mg/kg)

Arrange PE investigation (as per algorithm below)

If clinically stable assess suitability for Ambulatory Care

Wells Clinical Probability Score

	Points
Clinical Signs of DVT	3
Alternative diagnosis less likely than PE	3
Immobilisation (>3 days) or surgery previous 4 weeks	1.5
Previous DVT or PE	1.5
HR > 100 /min	1.5
Haemoptysis	1
Active Cancer	1

Total score > 4 points : PE likely
Total score 4 points or less : PE unlikely

Diagnostic Test Algorithm for Pulmonary Embolism

Contrast allergy Or severe renal impairment

Age < 40

Age > 40

Any age and massive/ submassive PE suspected (haemodynamically unstable and/or significant hypoxaemia)

CXR abnormal OR Chronic resp disease

No

Yes

VQ (SPECT) Scan

CTPA

➢ Risk Stratification of confirmed PE

Risk stratification is used to determine which subgroups may be at highest risk of clinical deterioration and therefore may benefit the most from more intense monitoring or perhaps even the administration of thrombolytic therapy. Likewise low risk patients may be suitable for outpatient ambulatory care [2, 6]

PE can be classified as:

- High Risk (Massive PE) :
  > 15% PE related mortality. Accounts for 5% of all cases
  Manifests as haemodynamic instability (cardiogenic shock or hypotension).

- Intermediate Risk (Submassive PE) :
  3-10% PE related mortality. Accounts for 15% of all PE cases
  Haemodynamically stable on presentation, but with evidence of right ventricular strain.

- Low Risk :
  <1% mortality. Accounts for 75% of all cases
  Haemodynamically stable and no signs of right ventricular strain.

Patients who are haemodynamically stable at presentation should be risk stratified using a combination of a clinical severity score (PESI score – see below) and assessment for right ventricular dysfunction using imaging and cardiac biomarkers [2]

Table 1 - Pulmonary Embolism Severity Index (PESI) Score

Criteria	**Points**	**Patients Score**
Age	1 point per year	
Male sex	10	
Active cancer (last 6 months)	30	
Heart failure	10	
Chronic lung disease	10	
Pulse > 110 /min	20	
Systolic BP < 100 mmHg	30	
Resp Rate > 30 /min	20	
Body temp < 36 C	20	
Altered mental state	60	
Oxygen Sats <90% on air	20	
	Total score	

Score	**Severity Index**	**30 day mortality**
< 65	I – very low risk	0.7%
66-85	II – low risk	1.2%
86-105	III – intermediate risk	4.8%
106-125	IV – high risk	13.6%
>125	V – very high risk	25%

Markers of right ventricular dysfunction should be assessed to stratify risk:

- Elevation of Troponin T (due to RV myocardial injury)
- CTPA features of Right Heart Strain (RV dilatation with RV:LV ratio >0.9).
  All CTPA reports should comment on the presence/absence of right heart strain
- ECHO features : RV dilatation or RV systolic dysfunction, septal bulge into LV (*ECHO should be considered in cases where the CTPA suggests Right Heart Strain, or the Trop T is positive in combination with a High PESI score or significant clot burden*)

➢ Intermediate Risk (Submassive) PE

Defined as significant acute pulmonary embolism, with evidence of right ventricular dysfunction and/or myocardial injury but without hypotension (SBP <90mmHg or ≥40mmHg drop from baseline for more than 15 minutes)

Management

Administer bolus dose of IV Unfractionated Heparin (80 Units/kg), followed by daily s/c LMWH (Tinzaparin 175 mg/kg) if the eGFR is > 20ml/min. If eGFR <20 ml/min, commence IV Heparin infusion at 1000U/hr and adjust as per APTT (See ‘’**Unfractionated Heparin Infusion Guideline**” target APTT 1.5-2.5). Monitor anti-Xa level if eGFR 20-30ml/min and patient given LMWH.

At present there is no definitive evidence that thrombolysis improves mortality in patients without shock, hypotension or cardiac arrest, compared to Heparin alone.

In general, these patients should be monitored very closely for the initial 48-72 hours (on CCU, HDU or AAU monitored bed), and thrombolysis considered early at signs of haemodynamic decompensation.

In cases of submassive PE where BP is maintained but multiple adverse prognostic indicators are present (extensive central clot burden on imaging, significant RV dysfunction on ECHO, severe hypoxaemia, positive Troponin, High Risk PESI score IV/V, coexisting proximal DVT, and age <75 years), thrombolysis can be considered but only on a case by case basis following discussion with Respiratory Consultant and/or Cardiology Consultant.

Patients with submassive PE at presentation will require a repeat ECHO at 3 months, and respiratory follow up, as there is a risk of developing chronic thromboembolic pulmonary hypertension.

➢ High Risk (Massive PE) & Thrombolysis

All cases of massive PE should be discussed with a medical consultant

Massive PE is PE so severe as to cause circulatory collapse and is due to acute right heart failure. It is defined as PE with hypotension (either systolic BP <90 mmHg or a pressure drop ≥40 mmHg, for more than 15 mins), that is not caused by a cardiac arrhythmia, hypovolaemia or sepsis.

The diagnosis of PE should be confirmed by an urgent CTPA. If clinically unstable for transfer to CT, an urgent portable ECHO showing either acute right ventricular dysfunction (where there is no other explanation for RV dysfunction) or a free floating thrombus in the right atrium or right ventricle. For urgent portable ECHO, within working hours contact cardiac technician or cardiology SpR. If out of hours and echo expertise is not available, then patient should be immediately stabilised with inotropic support if necessary and an urgent CTPA then performed.

Patients should be treated with unfractionated IV heparin whilst waiting for tests to confirm PE (Bolus dose of 80 IU/kg, and maintenance infusion 1000U/hr, adjusted to APTT 1.5-2.5, see "**Unfractionated Heparin Infusion Guideline**")

Thrombolysis is the first line treatment for massive PE. The expected therapeutic benefit should always be weighed up carefully against the risk of bleeding. The risk of major bleeding with thrombolysis is around 10%, with intracranial haemorrhage 2-3%. Risks and benefits should be discussed with patient when feasible. Thrombolysis may be instituted on clinical grounds alone if cardiac arrest is imminent.

Give thrombolysis <u>peripherally</u> not centrally as increased risk of bleeding.

<u>PE causing cardiac arrest or peri-arrest :</u>

- 50 mg IV bolus of **alteplase** (tPA) over 1-2 minutes

<u>Massive PE but not in cardiac or peri-arrest</u> :

- 100mg A**lteplase** diluted in 2mg/ml of water for injection
- 10 mg given as bolus over 1-2 minutes, remaining 90 mg over 2 hours
- N.B In patients less than 65kg, the total dose should not be more than 1.5mg/kg (but bolus dose of 10mg remains the same)
- Discontinue Heparin infusion whilst thrombolytic being administered

Follow thrombolysis with IV Heparin infusion. Immediately check APTT :

- If APTT ratio < 2, commence/resume IV heparin infusion (Maintenance Infusion 1000 U/hr). If APTT ratio is >2, wait and repeat after 4 hours
- Adjust to aim for an APTT ratio of around 2 (range 1.5-2.5)
- Check APTT 6 hours after any dose change
- Commence Warfarin on day 3, continue heparin for at least 5 days and until INR > 2 for 2 consecutive days
- N.B.If patient had received dose of LMWH prior to thrombolysis, Heparin infusion should only be commenced 18 hours after time of LMWH dose

All patients should be transferred to Intensive Care Unit, but thrombolysis should not be delayed whilst awaiting a bed.

If thrombolysis is contraindicated, or there is failure to respond to thrombolysis, therapeutic options include surgical or catheter thromboembolectomy. All cases should be discussed with the cardiothoracic consultant surgeon on call at the Heart Hospital. Mechanical treatment rather than repeat thrombolysis is favoured for persistent obstructing clot.

Contraindications to Thrombolysis

Absolute*

- Known history of intracranial haemorrhage at any time
- Ischaemic stroke in preceding 6 months
- Known cerebral neoplasm, arteriovenous malformation, or intracranial aneurysm
- Active internal bleeding
- Recent head trauma/ brain or spinal surgery/ head injury (within 8 weeks)
- Known bleeding diathesis

Relative

- Recent surgery (within 2 weeks)
- Oral anticoagulant therapy
- Prolonged traumatic resuscitation
- Non compressible blood vessel puncture in past 7 days
- Refractory Hypertension (systolic > 180 mmHg)
- Advanced liver disease
- Pregnancy or within 1 week post partum
- Infective endocarditis
- Active peptic ulcer disease

*Contraindications to thrombolysis that are considered absolute might become relative in a patient with immediately life threatening massive PE where alternative therapy not immediately available.

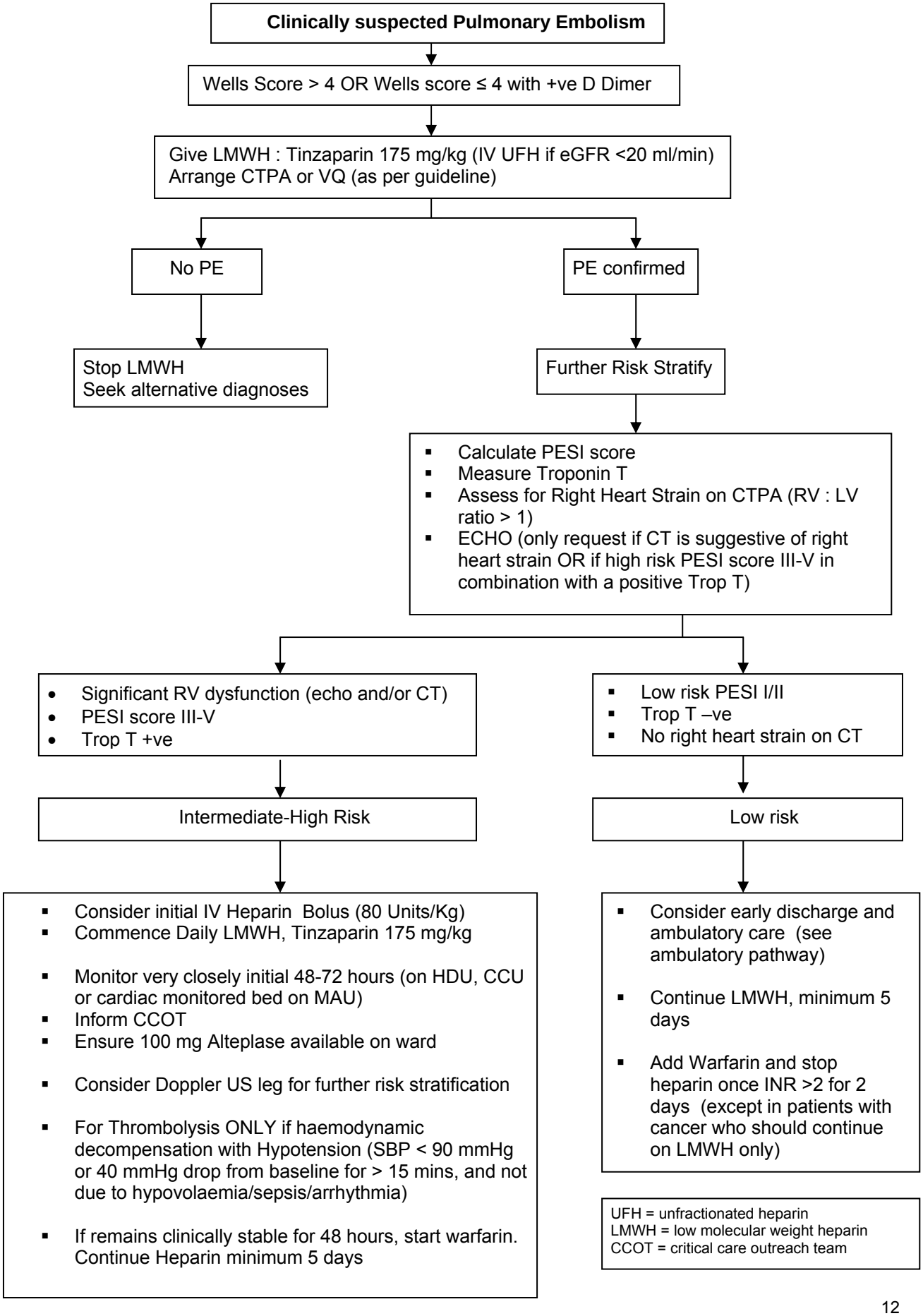
Discuss difficult cases with admitting medical consultant and Haematology Consultant on call.

➢ Low risk PE patients and Ambulatory Management

Selected patients at low risk of adverse outcome can be considered for outpatient/ambulatory investigation and management. The criteria include a low PESI score, negative troponin T, and no additional high risk condition

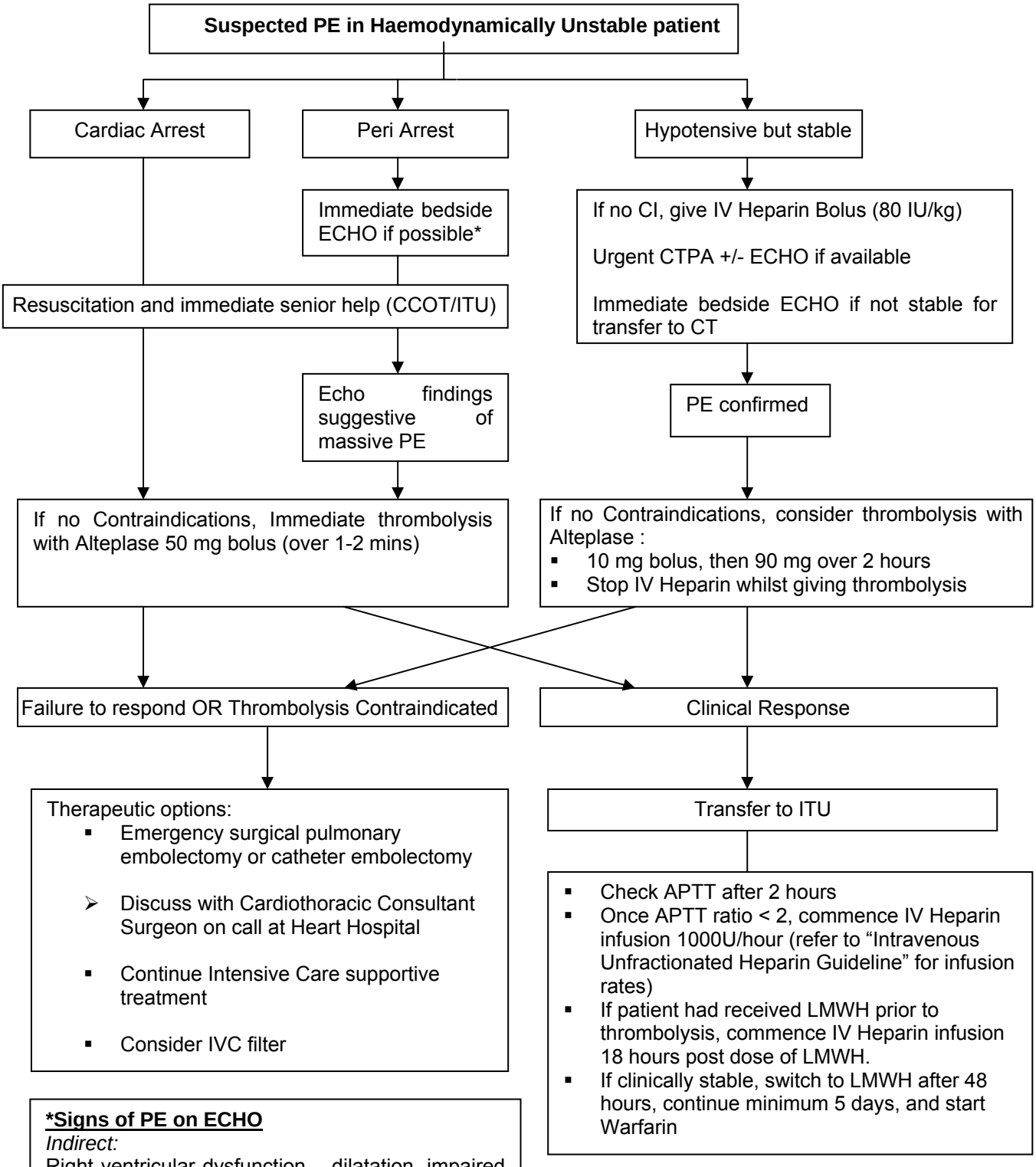
Refer to the '*Ambulatory PE Pathway guideline'* on intranet for further information.

Algorithm for Management of suspected PE in Haemodynamically Stable (SBP >90mmHg)



Algorithm for Management of suspected PE in Haemodynamically Unstable Patients

(SBP <90mmHg or drop of >40mmHg from baseline for >15 mins, and not due to hypovolaemia/sepsis/arrhythmia)



***Signs of PE on ECHO**

Indirect:

Right ventricular dysfunction – dilatation, impaired systolic function, free wall hypokinesia, paradoxical septal wall motion

Direct:

Thrombi in right atrium, right ventricle, or pulmonary artery

➢ Anticoagulation for treatment of VTE

	Please see Whittington Health Guidelines: **'Low Molecular Weight Heparin Prescribing Guideline"** **"Warfarin Prescribing in Adults Guideline"**

ASSESSMENT OF BLEEDING RISKS

- Assess and document bleeding risk prior to initiation of anticoagulation (Table 1)
- If bleeding risk increased seek advice from a senior member of the patient's team and/ or haematology

Table 1: Bleeding risks

Recent acute stroke (haemorrhagic or ischaemic)
History of GI bleed/ peptic ulcer
Blood pressure >200 mmHg systolic or >120 mmHg diastolic
Severe liver disease (prolonged prothrombin time or known varices)
Severe renal disease (creatinine clearance <30ml/min) with significant uraemia
Recent surgery or major trauma (especially to eye or nervous system)
Spinal intervention (e.g. lumbar puncture, spinal or epidural) planned or performed within 24 hours
Undergoing procedure with high risk of bleeding
Platelet count <100 (discuss with haematology)
Haemophilia or other known bleeding disorder (discuss with haematology)

BASELINE INVESTIGATIONS

- U&E, FBC, LFTs, coagulation screen

PATIENT COUNSELLING

All patients must be counselled regarding the risks, benefits and appropriate management of anticoagulation.

WHEN TO CONTACT HAEMATOLOGY FOR INITIAL ANTICOAGULATION ADVICE:

- Patients with an increased bleeding risk. Consideration may be given to split dosing of LMWH (87.5U/kg BD) or reduced dose tinzaparin
- Obese patients (weight >110kg): start on 175U/kg OD but consider monitoring anti-Xa levels to ensure adequate anticoagulation achieved
- Patients with confirmed VTE on therapeutic anticoagulation
- Patients with a history of allergic reactions to heparin or heparin-induced thrombocytopenia
- Patients with an e-GFR <30ml/min:
    - eGFR 20-30ml/min: 175U/kg (100% dose) with anti-Xa monitoring
    - eGFR <20ml/min: unfractionated heparin infusion

TINZAPARIN PRESCRIBING:
The standard therapeutic dose is 175 IU/kg once daily subcutaneously. The following chart should be used to select the correct dose and syringe size:

VTE Treatment: 175 IU/kg once daily SC (20 000 IU/ml formulation)			
	Weight (kg)	**Prescribed dose**	**Injection volume (ml)**
0.5ml syringe	37-42	7000	0.35
	43-48	8000	0.40
	49-53	9000	0.45
	54-59	10 000	0.50
0.7ml syringe	60-65	11 000	0.55
	66-70	12 000	0.60
	71-76	13 000	0.65
	77-82	14 000	0.70
0.9ml syringe	83-88	15 000	0.75
	89-93	16 000	0.80
	94-99	17 000	0.85
	100-105	18 000	0.90
Multi-dose vial	106-110	19 000	0.95
	111-116	20 000	1.00
	117-122	21 000	1.05
	123-128	22 000	1.10
	129-133	23 000	1.15
	134-139	24 000	1.20
	140-145	25 000	1.25

Cautions and contra-indications to LMWH:

Contra-indications	**Cautions**
History of heparin-induced thrombocytopenia	On oral vitamin K replacement antagonist with therapeutic INR
Hypersensitivity to UFH or LMWH	On treatment dose oral direct thrombin or Xa inhibitor (e.g. rivaroxaban or dabigatran)
Major or uncontrolled active bleeding	Increased bleeding risk
	eGFR <30ml/min

Monitoring of anti-coagulant activity:

- The following groups of patients may benefit from anti-Xa monitoring. **These patients must be discussed with haematology**:
    - Renal failure (eGFR <30ml/min).
    - Pregnancy
    - Obesity (weight >105kg)

How to take an anti-Xa level:

- Request on ICE including details of indication for monitoring, current dose, time of last dose and correct contact details of team to relay results. (Inform lab in advance if sample will arrive out of hours or at weekend)
- Sample must be taken **4 hours** post dose into a citrate vacutainer

- Hand deliver sample to lab (sample to be immediately centrifuged and frozen by lab before being sent to Royal Free hospital for analysis)

Monitoring for heparin induced thrombocytopenia (HIT):

- See "Low Molecular Weight Heparin" Prescribing Guideline for indications for platelet count monitoring.
- Suspect HIT if the platelet count falls by 50% or more from baseline (even if the platelet count remains within the normal range) or if patient develop venous/arterial thrombosis on heparin or skin lesions at heparin injection site
- If HIT suspected stop LMWH/UFH immediately and contact haematology urgently for advice

Patients with active cancer (cancer-related VTE):
In patients with cancer-related VTE, LMWH is the anticoagulant of choice instead of vitamin K antagonists.

COMMENCING PATIENTS ON WARFARIN:

If patients are being commenced on warfarin as an inpatient or through ambulatory care rather than the anticoagulation clinic**,** refer to the '**Warfarin prescribing for inpatients**' guideline for further information on **:**

- Counselling and consent
- Loading algorithm
- Patients must receive at least 5 days LMWH AND have an INR >2.0 on two consecutive days before the LMWH is stopped.

➢ Inferior vena cava (IVC) Filters

IVC filters are rarely indicated but consider if:

- Anticoagulation is contra-indicated. A retrievable IVC filter should be used if short term contraindication to anticoagulation, and decision made at the outset regarding timing of removal.
- Patients on therapeutic anticoagulation who have confirmed new VTE (despite INR 3.5 with adequate time in therapeutic range, and/or switch to LMWH)
- Pre-operative patient with PE (within 2 months) in whom anticoagulation must be interrupted and surgery cannot be delayed.

Discussions on a case by case basis should occur with Vascular Consultant Radiologist (Dr Kumaradevan), Consultant Respiratory Physician and Haematologists

➢ Classification of VTE causality

PROVOKED PE: an antecedent (within 3 months) major transient risk factor for VTE [1]:

- Surgery
- Trauma
- Significant immobility (bedbound, unable to walk unaided or spending a substantial proportion of day in bed/chair)
- Long haul flight (>4 hours)
- Pregnancy or puerperium
- Hormone therapy (HRT or oral contraceptives)

UNPROVOKED PE: no antecedent major transient risk factor and no known cancer.

CANCER-RELATED PE: with known active malignancy (diagnosed within 6 months, receiving chemotherapy/ radiotherapy, recurrent, inoperable or metastatic disease). Excludes skin squamous cell or basal cell carcinomas.

➢ Duration of anticoagulation

Circumstance of VTE	Duration	Target INR range
1st unprovoked PE Review by consultant haematologist to discuss long term anticoagulation	≥ 6 months (consider indefinite)	2.5 (2-3)
1st provoked PE (precipitating factors eg trauma, surgery, pregnancy)	6 months*	2.5 (2-3)
Recurrent PE	Long term	2.5 (2-3)
PE whilst taking warfarin with therapeutic INR	Long term	3.5 (3-4)
Cancer-related PE	≥6 months	Remain on LMWH

*could consider 3 months if concerns about bleeding risk, provided patient is asymptomatic, has been adequately anticoagulated (with therapeutic INR >75% of time), and not had significant PE at presentation (massive/submassive PE)

➢ Unprovoked VTE and screening for occult malignancy

Patients **aged >40 years** who experience an unprovoked PE or DVT should be investigated for occult malignancy as follows:

- Comprehensive history and full examination
- Chest X-ray, liver function tests, renal function, calcium, urinalysis, PSA
- Consider CT abdomen/pelvis and referral to the one-stop breast clinic (female patients)

Team which diagnoses the patient must request these investigations and follow up on the results.Tests should be performed within 2 weeks.

➢ Thrombophilia testing

There is no role for thrombophilia screening in patients with provoked VTE or in patients with unprovoked events where the decision has already been made to consider long term anticoagulation. **Patients who would benefit from testing need to be referred to the haematology clinic**

➢ Follow up arrangements

Referrals to Respiratory Medicine
Patients with PE require follow up in 3 months. Patients with massive and submassive PE at presentation will require a repeat ECHO at 3 months to monitor for resolution of right heart dysfunction. This should be requested by the discharging team

Referrals to Haematology:
- All patients with an unprovoked or recurrent VTE should be referred to Haematology outpatients for discussion regarding anticoagulation duration and consideration of long term anticoagulation therapy. They will be seen 3 months post event.
- Patients who may benefit from rivaroxaban as an alternative to warfarin

Referrals to Oncology:
All patients with active cancer should continue on LMWH therapy and their treating oncologist informed. LMWH therapy should continue for at least 6 months when the need for on-going anticoagulation should be re-assessed.

➢ Discharge Checklist

Please tick and file in patient notes.

- Written patient information leaflet on PE provided.
- Reason for anticoagulation, expected duration of therapy
- If starting warfarin outside the anticoagulation clinic:
  - counselled regarding warfarin
  - Arrangements for INR testing between discharge and 1st anticoagulation clinic appointment (if required)
- Referral to anticoagulant clinic, date and time of appointment.
- Referral to respiratory outpatients (and repeat echo requested if required)
- Discharge letter to GP with information on : duration, indication, target INR.
- Unprovoked PE:
  - further assessment for malignancy undertaken
  - additional investigations requested if appropriate
  - plan in place to follow up on results
  - Red top referral made to haematology for discussion of long term anticoagulation (to be seen 3 months post event)

➢ Reporting of hospital acquired VTE

There is a requirement to report and investigate hospital acquired VTE. All patients diagnosed with a PE as an inpatient or within 90 days of a hospital admission (even if admission was to a different hospital) should be notified to the VTE CQUIN working group by e-mailing the details to:

Whh-tr.VTE-Enquiries@nhs.net

➢ Contacts

- Consultant Respiratory Physician (via switchboard or Respiratory secretaries ext 5353 or 5354)
- Respiratory team SpRs (bleep 3359/3049).

- Haematology consultants via Switchboard
- Haematology SpRs (bleep 3060 and 3037)

Out of hours:

- Medical registrar (bleep 3300)
- Consultant physician on-call (via switch)
- Haematologist on-call (via switch)

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(6) Jaff MR, McMurtry MS, Archer SL, Cushman M, Goldenberg N, Goldhaber SZ, et al. Management of massive and submassive pulmonary embolism, iliofemoral deep vein thrombosis, and chronic thromboembolic pulmonary hypertension: a scientific statement from the American Heart Association. Circulation 2011 Apr 26;123(16):1788-830.

		Yes/No	Comments
1.	**Does the procedural document affect one group less or more favourably than another on the basis of:**		
	• Race	No	
	• Ethnic origins (including gypsies and travellers)	No	
	• Nationality	No	
	• Gender	No	
	• Culture	No	
	• Religion or belief	No	
	• Sexual orientation including lesbian, gay and bisexual people	No	
	• Age	No	
	• Disability - learning disabilities, physical disability, sensory impairment and mental health problems	No	
2.	**Is there any evidence that some groups are affected differently?**	No	
3.	**If you have identified potential discrimination, are any exceptions valid, legal and/or justifiable?**	No	
4.	**Is the impact of the procedural document likely to be negative?**	No	
5.	**If so can the impact be avoided?**	N/A	
6.	**What alternatives are there to achieving the procedural document without the impact?**	N/A	
7.	**Can we reduce the impact by taking different action?**	N/A	

Checklist for the Review and Approval of Procedural Document

To be completed and attached to any procedural document when submitted to the relevant committee for consideration and approval.

	Title of document being reviewed:	Yes/No	Comments
1.	**Title**		
	Is the title clear and unambiguous?	Yes	
	Is it clear whether the document is a guideline, policy, protocol or standard?	Yes	
2.	**Rationale**		

	Title of document being reviewed:	Yes/No	Comments
	Are reasons for development of the document stated?	Yes	
3.	**Development Process**		
	Is it clear that the relevant people/groups have been involved in the development of the document?	Yes	
	Are people involved in the development?	Yes	
	Is there evidence of consultation with stakeholders and users?	Yes	Respiratory, haematology, pathology, ambulatory care
4.	**Content**		
	Is the objective of the document clear?	Yes	
	Is the target population clear and unambiguous?	Yes	
	Are the intended outcomes described?	Yes	
5.	**Evidence Base**		
	Are key references cited in full?	N/A	
	Are supporting documents referenced?	N/A	
6.	**Approval**		
	Does the document identify which committee/ group will approve it?	Yes	
7.	**Dissemination and Implementation**		
	Is there an outline/plan to identify how this will be done?	Yes	
8.	**Document Control**		
	Does the document identify where it will be held?	Yes	
9.	**Process to Monitor Compliance and Effectiveness**		
	Are there measurable standards or KPIs to support the monitoring of compliance with and effectiveness of the document?	Yes	
	Is there a plan to review or audit compliance with the document?	Yes	
10.	**Review Date**		
	Is the review date identified?	Yes	
	Is the frequency of review identified? If so is it acceptable?	Yes	
11.	**Overall Responsibility for the Document**		

	Title of document being reviewed:	Yes/No	Comments
	Is it clear who will be responsible for co-ordinating the dissemination, implementation and review of the document?	Yes	

Executive Sponsor Approval			
If you approve the document, please sign and date it and forward to the author. Procedural documents will not be forwarded for ratification without Executive Sponsor Approval			
Name		Date	
Signature			
Relevant Committee Approval			
The Director of Nursing and Patient Experience's signature below confirms that this procedural document was ratified by the appropriate Governance Committee.			
Name		Date	
Signature			
Responsible Committee Approval – only applies to reviewed procedural documents with minor changes			
The Committee Chair's signature below confirms that this procedural document was ratified by the responsible Committee			
Name		Date	
Name of Committee		Name & role of Committee Chair	
Signature			

Tool to Develop Monitoring Arrangements for Policies and guidelines

What key element(s) need(s) monitoring as per local approved policy or guidance?	Who will lead on this aspect of monitoring? Name the lead and what is the role of the multidisciplinary team or others if any.	What tool will be used to monitor/check/observe/Assess/inspect/ authenticate that everything is working according to this key element from the approved policy?	How often is the need to monitor each element? How often is the need complete a report? How often is the need to share the report?	What committee will the completed report go to?
Element to be monitored	**Lead**	**Tool**	**Frequency**	**Reporting arrangements**
Appropriate requesting of D-dimers in PE and compliance with Ambulatory Pathway	Ambulatory care Team	Wells score and action taken following D-dimer result	Within 3 months of implementation; then annually	
Appropriate requesting of diagnostic investigations as per algorithm	Respiratory Lead for PE	Review of management in accordance with guideline	Annually	
Thrombolysis for massive PE				
Cancer screening for PE	Oncology (Pauline Leonard)	Compliance with guideline and detection rate of occult malignancy	Within 6 months of implementation, then annually	