Standard Operating Procedure				NHS South Warwickshire NHS Foundation Trust
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Warwick Hospital		1.2	**May 2019**	**May 2024**
SWH 03156	**Pulmonary Embolism: Ambulatory Care Pathway (Adults)**			
Replacing Document:	New Document			
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Ratified by:	Thrombosis Committee, Drug & Therapeutics Committee			

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16/05/2019	SWH 03156 v1.0	Pulmonary Embolism: Ambulatory Care Pathway (Adults)	DTC / Thrombosis Committee	Document Approved
23/04/2020	SWH 03156 v1.1	Pulmonary Embolism: Ambulatory Care Pathway (Adults)	Thrombosis Committee	Link to PERC rule added as per NG158
17/09/2021	SWH 03156 v1.2	Pulmonary Embolism: Ambulatory Care Pathway (Adults)	DTC	Switch from Tinzaparin to Enoxaparin

1 Purpose/Objective

Patients presenting with suspected pulmonary embolism (PE) are often investigated and treated as an outpatient via Ambulatory Emergency Care (AEC). This SOP formalizes guidance regarding the ambulatory (outpatient) assessment and management of adult patients (age ≥16) referred to AEC at Warwick Hospital with suspected PE. Algorithms are provided for risk stratifying and investigating patients with *suspected* PE and for managing patients with *confirmed* PE on an ambulatory basis. A separate algorithm provides guidance for pregnant patients with suspected PE.

2 Audience

This document applies to all clinicians caring for patients aged 16 years and above who are referred to Ambulatory Emergency Care (AEC) at Warwick Hospital with symptoms suggestive of a pulmonary embolism (PE).

3 See Pages 2-11 for content of SOP

4 Incident Reporting

In the event of an incident relating to **Pulmonary Embolism: Ambulatory Care Pathway (Adults)** it will be reported via the Incident Reporting system (Datix) as described in the Incident Management Policy including the Management of Serious Incidents (SWH 00020) and the Being Open and the Duty of Candour (SWH 00356).

Pulmonary Embolism Ambulatory Care Pathway (Adults)

Click on the links below to go directly to the relevant section:

01 Initial Assessment & Management of Suspected PE

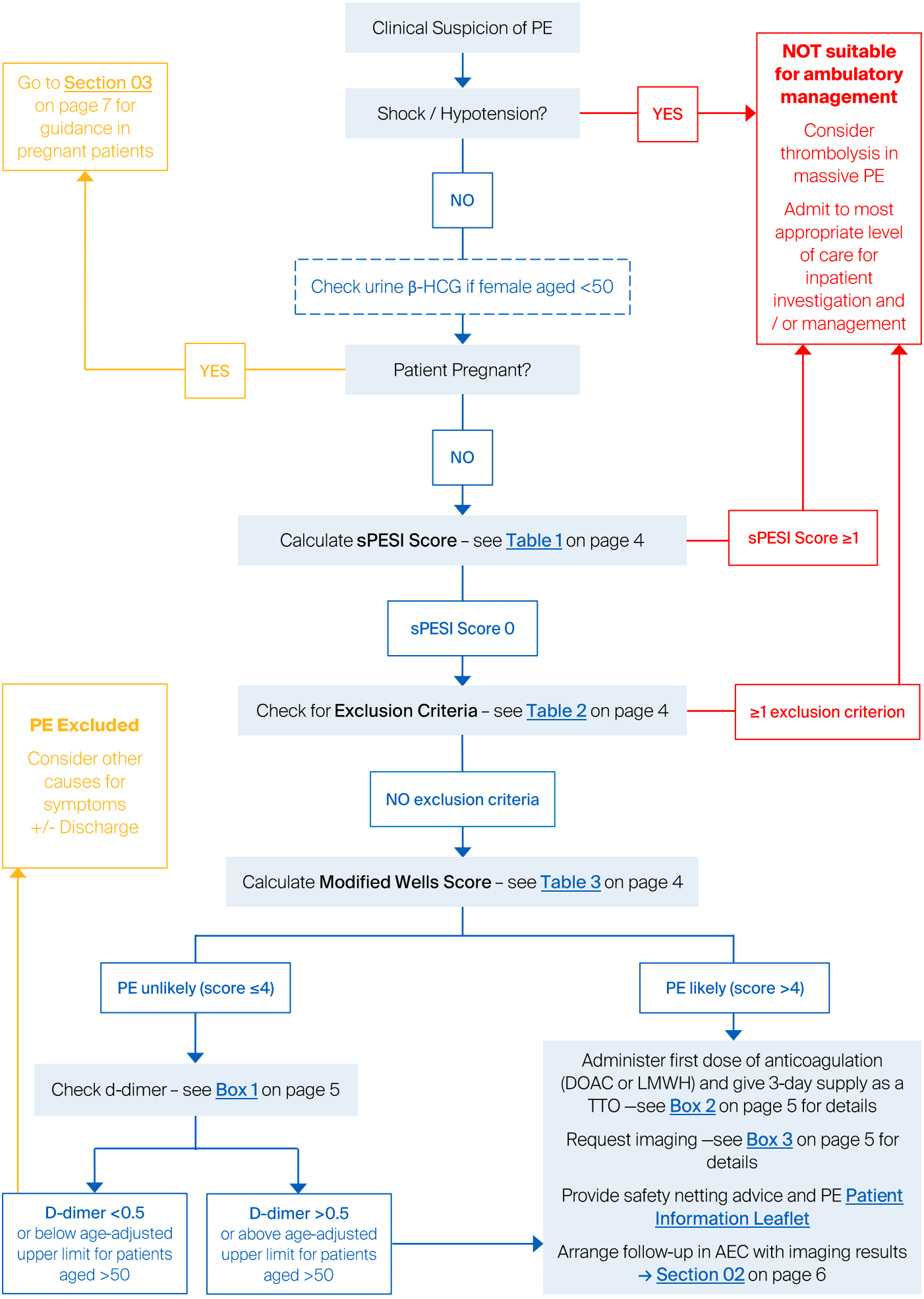

Table 1: simplified Pulmonary Embolism Severity Index (sPESI) Score

Parameter		Score (circle)
Demographic features	Age >80 years	+1
Comorbid conditions	History of cancer	+1
	History of chronic cardiopulmonary disease	+1
Clinical findings	Heart rate ≥ 110bpm	+1
	Systolic blood pressure <100mmHg	+1
	O_2 saturation <90% (with or without supplemental oxygen)	+1
	Total Score:	

sPESI score of 0 predicts low risk of 30-day mortality (1.1%) and recurrent VTE or major non-fatal bleeding (1.5%), identifying patients who may be suitable for outpatient (ambulatory) investigation and management

Table 2: Clinical Exclusion Criteria for Ambulatory Investigation & Management

○ Haemodynamic instability*	○ Severe renal impairment (CrCl <15mL/min)
○ Oxygen saturation <90%	○ Severe hepatic impairment
○ Severe pain requiring opioid analgesia	○ Heparin-induced thrombocytopenia (HIT) where there is no alternative to heparin treatment
○ Active bleeding or high risk of bleeding†	
○ Currently receiving treatment-dose anticoagulation	○ Social barriers e.g. inability to return for follow-up, inadequate care at home, lack of telephone communication, concerns over compliance
○ Other medical problem/s requiring hospital admission	
○ Severe obesity (weight >150kg)	

* SBP <100mmHg with HR >100bpm; condition requiring thrombolysis, embolectomy or admission to HDU / ITU

† Gastrointestinal bleeding in the preceding 14 days, recent stroke (<4 weeks ago), recent operation (<2 weeks ago), bleeding disorder, thrombocytopenia (platelet count <75x10^9/l), uncontrolled hypertension (SBP >180mmHg or DBP >110mmHg)

Table 3: Modified Wells Score for PE

Clinical feature	Points	Patient Score
Clinical signs and symptoms of DVT	3	
An alternative diagnosis is less likely than PE	3	
Heart rate > 100 beats per minute	1.5	
Immobilisation for more than 3 days or surgery in the previous 4 weeks	1.5	
Previous DVT/PE	1.5	
Haemoptysis	1	
Malignancy (on treatment, treated in the last 6 months, or palliative)	1	
Clinical probability simplified scores		
PE *likely*	Total >4	
PE *unlikely*	Total ≤4	

Box 1: Age-adjusted d-dimer levels

Patients aged ≤50 years	Patients aged >50 years
d-dimer levels >0.5mg/L should be considered as elevated	d-dimer levels > patient age (in years) / 100 should be considered as elevated e.g. in an 82-year-old patient, d-dimer levels >0.82mg/L (82 / 100) should be considered elevated
DO NOT use d-dimer levels to exclude PE in pregnancy or in patients with a modified Wells score > 4	

Box 2: Anticoagulation for *suspected* PE in **non-pregnant** patients

- Check Hb, platelet count, U&Es, LFTs and coagulation profile
- Check for contraindications to anticoagulation and assess bleeding risk
- Offer patient treatment with either LMWH or DOAC until diagnosis is confirmed / excluded:

Enoxaparin (Inhixa®) –first line in patients with active malignancy	Apixaban (Eliquis®)
See SWFT anticoagulation prescription chart for dosing tables by body weight and risk category Recommended dosage in severe renal impairment (CrCl 15-30mL/min) is **1mg/Kg** (100IU/Kg) **ONCE daily** Contraindicated if CrCl <15mL/min **—seek haematology advice** Prescribe on yellow anticoagulation chart Train patient / carer to self-administer injections (or refer to District Nurses for administration at home) Complete Enoxaparin Self-Administration Checklist —see Section 05 on page 11 Provide patient with sharps bin and 3-day supply as a TTO	**10 mg BD PO** for first 7 days only Contraindicated if CrCl <15mL/min Use with caution if CrCl 15-29mL/min Prescribe first dose on drug chart and administer Provide patient with 3-day supply as a TTO

Box 3: Imaging for suspected PE → **ensure CXR performed first**

CT-Pulmonary Angiogram (CTPA)	Ventilation-Perfusion (V/Q) Scan
should be considered as first-line choice of imaging for most patients: • submit request via Lorenzo on behalf of the Consultant responsible for the patient • include details of symptoms, risk factors for VTE, modified Wells score, CXR findings, latest CrCl (must be >30mL/min) and d-dimer level (if indicated by Wells Score) • ensure you select Priority as **'Urgent'** and Encounter Type as **'Ambulatory'** to avoid delays in imaging	is recommended first-line if the patient has a **normal CXR** and: • is pregnant or breastfeeding (after negative Doppler USS first if clinical symptoms / signs of DVT) *or;* • has a known allergy to CT contrast *or;* • has severe renal impairment (CrCl <30mL/min) *or;* • is female aged <40 years For details on how to request a V/Q scan please see Section 04 on page 10

02 Ambulatory Management of Patients with Confirmed PE

Clinical review in AEC with results of imaging (CTPA or V/Q)

- **Positive for PE**
- **Indeterminate Result** → **Seek Senior Advice**
  Consider CTPA if initial scan was V/Q
- **Negative for PE** → **PE Excluded**
  Discontinue anticoagulation
  Consider other causes for symptoms
  +/- Discharge

Repeat obs, reassess sPESI Score (Table 1 on page 4) and recheck for Exclusion Criteria (Table 2 on page 4)

- **sPESI Score 0** *and;*
  NO Exclusion Criterion *and;*
  NO other cause for clinical concern
  → Check Troponin
  Review CTPA for RV strain *or;*
  consider ECHO if diagnosed on V/Q or leg USS
  - **NO RV Strain** *and*
    NORMAL Troponin
    → Screen for malignancy if **unprovoked** PE
    - History focusing on 'red flags' for malignancy
    - Full examination (including breasts in females)
    - Review of chest imaging
    - FBC, U&E, LFT, Calcium (and PSA in older men)
    - Perform urinalysis
    - Further targeted investigations based on findings above
    - Consider further imaging (e.g. CT A/P) if age >40 and strong clinical suspicion for underlying malignancy with no obvious primary after above evaluation

    → Provide 28-day supply of anticoagulation using the guidance in Box 4 on page 8

    Ensure patient understands need for continued anticoagulation –further prescriptions must be obtained from their GP

    Ensure PE Patient Information Leaflet has been provided

    Refer to anticoagulation clinic via form on e-records (Evolve) for follow-up if unprovoked PE
  - **RV Strain on imaging** *or*
    ELEVATED Troponin
    → **NOT suitable for ambulatory management**
    Admit to most appropriate level of care for inpatient management
- **sPESI Score ≥1** *or;*
  ≥1 Exclusion Criterion *or;*
  Other cause for clinical concern
  → **NOT suitable for ambulatory management**
  Admit to most appropriate level of care for inpatient management

03 Ambulatory Management of PE in Pregnancy

South Warwickshire NHS Foundation Trust

Refer to SWH 00259 Therapeutic Anticoagulation in Pregnancy, Labour and Post Delivery for more information

Clinical Suspicion for PE

Perform ECG and CXR

Check for Exclusion Criteria – see Table 2 on page 4

≥1 Exclusion Criterion

NOT suitable for ambulatory management

Admit to most appropriate level of care for inpatient investigation and / or management

NO Exclusion Criteria

Consultant Review

Administer first dose of LMWH and give 3-day supply as a TTO –see Box 5 on page 9 for details

sPESI Score and **Wells Score** are not validated in pregnancy and should not be used to risk stratify / assess pre-test probability of PE

D-dimers are often elevated in normal pregnancy and negative d-dimer levels should not be used to rule out a diagnosis of PE in pregnancy

Clinical Suspicion for DVT?

YES

Request Duplex Ultrasound of affected leg and arrange follow-up in AEC with scan results

Positive for DVT*
Treat as for PE

*further imaging with V/Q or CTPA not usually required

Reassess for Exclusion Criteria – see Table 2 on page 4

Check Troponin

Review CTPA for RV strain *or;*

Consider ECHO if diagnosed on V/Q or leg US

≥1 Exclusion Criteria *or;*
RV Strain on imaging *or;*
ELEVATED Troponin

NO Exclusion Criteria
NO RV Strain
NORMAL Troponin

Provide 28-day supply of LMWH as TTO - see Box 5 on page 9 for details

Ensure patient understands need for continued anticoagulation throughout the rest of their pregnancy

Inform patient's GP and Midwife / Obstetrician

Refer to Haematology-Obstetrics Clinic (dictated letter to Dr Arbuthnot)

NO

Negative for DVT

CXR Normal?

YES

NO

Provide PE in Pregnancy Patient Information Leaflet and counselling regarding imaging in pregnancy

Request V/Q scan –see Section 04 on page 10

Request CTPA via Lorenzo

Provide safety-netting advice
Arrange follow-up in AEC with scan results

Positive for PE

Negative for PE

PE Excluded

Discontinue anticoagulation

Consider other causes for symptoms

+/- Discharge

Box 4: Anticoagulation for *confirmed* PE in **non-pregnant** patients

- Check Hb, platelet count, U&Es, LFTs and full coagulation profile (INR / PT, APTT, fibrinogen, D-dimers)
- Check for contraindications to anticoagulation and assess bleeding risk
- Most patients should be offered treatment with a DOAC (apixaban) unless contraindicated (e.g. CrCl <15mL/min) or patient preference for VKA (warfarin) after counselling
- Anticoagulation for confirmed PE should continue for:

  First episode of provoked PE with reversible risk factor: minimum of 3 months

  First episode of unprovoked PE: minimum of 6 months (consider extended duration / indefinite anticoagulation depending on risk of recurrence, risk of bleeding and patient preferences)

  Second episode of unprovoked PE: indefinite (life-long) anticoagulation
- Patients with **severe renal impairment** (CrCl<15mL/min) should be offered treatment with warfarin
- Patients with **active malignancy** should be treated initially with LMWH (refer to Thrombosis Clinic if considering alternative anticoagulant i.e. DOAC) for at least 6 months

Apixaban (Eliquis®)	Warfarin	Enoxaparin (Inhixa®)
10 mg BD PO for first 7 days (remember to take into account any days that patient received apixaban for prior to diagnosis being confirmed) **5 mg BD PO** thereafter (dose may be reduced to 2.5mg BD after 6 months for patients receiving extended duration / indefinite anticoagulation to reduce risk of recurrent VTE) Contraindicated if CrCl<15mL/min (use with caution if CrCl 15-29mL/min) Complete APC Checklist and email / fax to GP – ring GP practice to ensure receipt and file in medical notes Provide patient with apixaban patient information leaflet and 28-day supply as a TTO Refer to anticoagulation clinic via form on e-records (Evolve) if unprovoked PE	**5mg OD for 2 days**, recheck INR on day 3 and adjust dose according to Table 4 on page 9 Lower initial dose e.g. 3mg OD for 2 days should be considered if: • Frail /elderly • Malnutrition or low body weight • Heart failure or liver disease Patients being newly initiated on warfarin should continue taking **overlapping LMWH for a minimum of 5 days** (and until INR is in therapeutic range) Provide patient with yellow warfarin book and packs of 1mg and 3mg warfarin tablets as TTO Refer to anticoagulation service to provide warfarin counselling and to take over prescribing and monitoring of INR at the earliest opportunity –telephone **ext. 4493** and send referral form via e-records (Evolve)	See SWFT anticoagulation prescription chart for dosing tables by body weight and risk Recommended dosage in severe renal impairment (CrCl 15-30mL/min) is **1mg/kg** (100IU/Kg) **ONCE daily** Contraindicated if CrCl <15mL/min, thrombocytopenia (platelet count < 50 x 0^9/L), HIT or heparin allergy **–seek haematology advice** Train patient / carer to self-administer injections or refer to District Nurses for home admin Complete Enoxaparin Self-Administration Checklist –see Section 05 on page 11 Provide patient with sharps bin and 28-day supply as a TTO Inform GP (+/- Oncology) Refer to anticoagulation clinic via form on e-records (Evolve) if unprovoked

Table 4: Warfarin Initiation Dosing Protocol

Day	INR	Warfarin Dose
1-2	–	3-5mg OD
3	<1.5	5-7.5mg OD
	1.5-1.9	2.5-5mg OD
	2.0-2.5	2.5mg OD
	>2.5	Omit and recheck INR next day
5	<1.5	7.5-10mg OD
	1.5-1.9	5-7.5mg OD
	2.0-3.0	2.5-5mg OD
	>3.0	Omit and recheck INR next day

Box 5: Anticoagulation for *suspected / confirmed* PE in **pregnancy**

- Check Hb, platelet count, U&Es, LFTs and full coagulation profile (INR / PT, APTT, fibrinogen, D-dimers)
- Check for contraindications to anticoagulation and assess bleeding risk
- Offer patient treatment with LMWH (Enoxaparin) unless contraindicated (see below)
- If PE is confirmed, LMWH should be continued throughout pregnancy (and discontinued at first signs of active labour or 24h prior to any planned delivery)
- Anticoagulation should continue for **at least 3 months post-partum** in confirmed PE
- Warfarin is contraindicated during pregnancy but may be started ≥ 5 days post-partum and is safe in breastfeeding
- DOACs are not recommended during either pregnancy or breastfeeding

Enoxaparin (Inhixa®) –USE PRE-FILLED PENS ONLY IN PREGNANCY

Refer to SWFT Guideline Therapeutic Anticoagulation in Pregnancy, Labour and Post Delivery (SWH 00259) for dosing tables by body weight –use patient's booking / pre-pregnancy weight rather than their current weight for dosing

Contraindicated if CrCl < 15mL/min, thrombocytopenia (platelet count < 50 x 10^9/L), HIT or heparin allergy **–seek haematology advice**

Routine monitoring of platelet count and peak anti-Xa levels is not required except in women at extremes of body weight or with other complicating factors e.g. renal impairment, recurrent VTE

Train patient/carer to self-administer injections and complete Enoxaparin Self-Administration Checklist – see Section 05 on page 11 –or refer to District Nurses for administration at home

Provide patient with a sharps bin and 3-day supply (prior to diagnosis) or 28-day supply (after confirmation of diagnosis) of LMWH as a TTO

Inform GP / Midwife if diagnosis of PE is confirmed and refer patient to the Haematology-Obstetrics clinic by dictating a letter to Dr Arbuthnot (copy to patient's Obstetrician)

04 V/Q Scan Requests

- V/Q scans are performed by Nuclear Medicine at UHCW on Mondays, Tuesdays and Fridays
- V/Q scan is the investigation of choice for the diagnosis of PE in pregnant patients **with a normal CXR** as it delivers significantly less radiation to the maternal breasts and lungs than CTPA
- In pregnant patients, Wells' score is not validated, and d-dimers have low sensitivity and specificity –high d-dimers are common in pregnancy and are not diagnostic of PE; low d-dimers should not be used exclude PE in the pregnant population

Failure to follow ALL the instructions below is likely to result in rejection of the V/Q scan request and / or diagnostic delay with risk to patient safety

1. Prior to requesting a V/Q scan, ensure that patient has had a CXR and that this is normal
2. Request V/Q scan on the PDF nuclear medicine form ensuring that:
   - patient's address is written out in full (2 lines of address on patient label is not adequate)
   - patient's home telephone AND mobile numbers are written on the request card
   - clinical details (including the fact that the CXR is normal) are written out in full
   - GMC number of the requesting doctor AND consultant is clearly printed on the request
3. Email completed request form (will need to print off to sign and scan back in) to Nuclear Medicine at UHCW uhc-tr.nucmedcoventry@nhs.net and file a copy in the medical notes
4. Telephone Nuclear Medicine at UHCW on **02476 968 212** to confirm receipt of the form
5. Administer first dose of DOAC or LMWH (based on weight at booking rather than current weight if pregnant) –ensure arrangements are in place for the patient to receive DOAC / LMWH until at least the following Monday, Tuesday or Friday (whichever comes first)
6. Advise patient prior to discharge that they:
   - will need to continue taking DOAC / LMWH daily until they are scanned
   - will be contacted directly by UHCW regarding their V/Q scan appointment
   - should come back to AEC immediately after their scan with their printed report for review
   - should contact AEC on **01926 495 321** ext. **4365** or **4366** if they have not heard from UHCW within 3 days of discharge or if they have any other concerns / need advice
   - should represent directly to ED if they develop severe chest pain, breathing difficulties, light-headedness / syncope, haemoptysis or other signs of abnormal bleeding

05 Enoxaparin (Inhixa®) Self-Administration Checklist

Please complete all sections by ticking the relevant boxes, sign and date at the bottom then file completed checklist in the medical notes.

Section 1: Initial Assessment

	Question	Yes	No	N/A
1	Is the patient or a carer willing to, with training, administer Enoxaparin?			
2	Does the patient or carer have the capability to recall instructions about Enoxaparin and how to administer it?			
3	Does the patient or carer have the capability to understand the need for Enoxaparin, the dosage and the frequency of administration?			
4	Does the patient or carer have the manual dexterity to handle the device and inject?			
5	Does the patient or carer have any sight impediment that could affect their ability to self-administer?			
6	Does the patient have any other risk factors that could impede their ability to self-administer?			

Section 2: Training Checklist

	Question	Yes	No
1	Has the patient or carer been made aware of and understand what Enoxaparin is for?		
2	Has the patient or carer been made aware of and understand the location of injection and that it should be injected slowly over 15 seconds?		
3	Has the patient or carer been made aware of and understand the need for injection site rotation?		
4	Has the patient or carer been made aware of and understand how to dispose of the medication safely (provide sharps bin)?		
5	Has the patient or carer been made aware of and understand the signs and symptoms of bleeding?		
6	Has the patient or carer been made aware of the PIL and any supporting information?		
7	Has the patient or carer had a demonstration by a qualified professional?		

Healthcare Professional providing assessment and counselling / training:

Name (PRINT):	Role / Grade:	Registration No:
Signature:	Date:	Time:

06 References

1. Howard L S, *et al.* British Thoracic Society (BTS). Guideline for the initial outpatient management of pulmonary embolism. *Thorax* 2018. 73: ii 1-29. Available at: https://www.brit-thoracic.org.uk/quality-improvement/guidelines/pulmonary-embolism/

2. Royal College of Obstetrics and Gynaecology (RCOG). Thromboembolic Disease in Pregnancy and the Puerperium: Acute Management (Green-top Guideline No. 37b) 2015. Available at: https://www.rcog.org.uk/globalassets/documents/guidelines/gtg-37b.pdf

3. National Institute for Health and Care Excellence (NICE). Venous thromboembolic diseases: diagnosis, management and thrombophilia testing (Clinical Guideline CG144) 2012 (Updated 2015). Available at: https://www.nice.org.uk/guidance/cg144

07 PERC Rule and other Calculators / Scoring Tools

Pulmonary Embolism Rule-Out Criteria (PERC) Rule

simplified Pulmonary Embolism Severity Index (sPESI)

Modified Wells Score

Age-Adjusted D-dimer

Creatinine Clearance (Cockroft-Gault)

Estimating Risk of Bleeding

RIETE Score for Risk of Haemorrhage in Pulmonary Embolism Treatment

HAS-BLED Score for Major Bleeding Risk

Predicting Risk of Recurrent VTE

DASH Prediction Score for Recurrent VTE

Vienna Prediction Model for Recurrent VTE

HERDOO2 Rule for Discontinuing Anticoagulation in Unprovoked VTE