Acute Management of Venous Thromboembolism in Pregnancy and the Puerperium - Full Clinical Guideline

Reference No.: UHDB/Obs/12:23/T1

Contents

1. Introduction and Background

Venous thromboembolism (VTE) remains the leading cause of direct maternal deaths during or up to 6 weeks after the end of pregnancy. In the most recent Confidential Enquiry this accounted for 1.39 deaths per 100,000 maternities. Despite improved risk stratification and thromboprophylaxis in pregnancy and the puerperium the mortality rate is now similar to that in 1985-87 and has risen from the previous 2 triennial reports, which probably reflects an increasing prevalence of risk factors in the UK maternity population.

Venous thromboembolism can occur at any stage of pregnancy due to: hypercoagulable state; stasis in the pelvic veins as a result of compression by the gravid uterus; vascular trauma induced by delivery.

Although the absolute risk of VTE in pregnancy remains low at around 1 in 1000 pregnancies it is significantly higher than in non pregnant women of the same age, increased 4-5 fold in the antenatal period and up to 20 fold in the puerperium with over 40% of VTE occurring after discharge from hospital.

Approximately one third of deaths due to VTE occur antenatally, of concern the fact that half of these occur in the first trimester.
Two thirds of deaths occur in the postnatal period, the majority following Caesarean delivery.
More than 50% of women dying from acute VTE in pregnancy have a BMI > 30

Reducing the risk requires proactive risk assessment and thromboprophylaxis as early as possible in pregnancy, repeated during admission, if intercurrent problems develop and immediately postnatal. However it remains possible for acute VTE to occur despite thromboprophylaxis or in women without risk factors and a high index of suspicion, early investigation and treatment are recommended. Up to 25% of untreated DVT will develop PE. PE can be fatal in up to 15%, often very shortly after presentation. Delays in diagnosis and treatment or inadequate treatment continue to contribute to highlighted substandard care in Confidential Enquiries.

Definitive confirmation of diagnosis is recommended. Subjective clinical assessment is highly unreliable in pregnancy (confirmed in only 2-6% of clinically suspected PE).

2. Purpose and Outcomes

To provide all relevant healthcare professionals with evidence based guidance on the immediate investigation and management of women with suspected VTE in pregnancy or the puerperium.

This does not remove the need for any pregnant women presenting outside of the obstetric service to be managed in conjunction with an Obstetrician

It does not cover thromboprophyaxis in pregnancy or management of other thrombotic disorders. For thromboprophylaxis see clinical guideline: ‘Thromboprophylaxis during and up to 6 weeks after pregnancy – Maternity and Gynaecology (T8)’

3. Abbreviations

ABG	-	Arterial blood gases
CLC	-	Consultant Led Care
COH	-	Combined Obstetric Haematology clinic
CTG	-	Cardiotocograph
CTPA	-	Computed tomography pulmonary angiogram
CXR	-	Chest Xray
DOAC	-	Direct Oral Anticoagulant
DVT	-	Deep Vein Thrombosis
ECHO	-	Echocardiogram
FH	-	Family History
ICH	-	Intracranial haemorrhage

IHD - Ischaemic heart disease
LMWH - Low molecular weight heparin
MRI - Magnetic resonance imaging
MWLC - Midwife Led Care
NOAC - Non-Vitamin K antagonist oral anticoagulant
PE - Pulmonary embolism
PNH - Paroxymal Noctural Haemoglobinuria
PTS - Post thrombotic syndrome
SROM - Spontaneous rupture of membranes
UFH - Unfractionated Heparin
VTE - Venous thromboembolism
V/Q - Ventilation perfusion scan

4. Risk Factors for VTE in Pregnancy

<table>
<tr><td rowspan="10">Pre-existing</td><td colspan="2">Previous VTE</td></tr>
<tr><td rowspan="3">Thrombophilia</td><td>Heritable high risk
Antithrombin deficiency
Protein C deficiency
Protein S deficiency
Homozygous defects
Compound defects</td></tr>
<tr><td>Heritable low risk
Factor V Leiden (heterozygous)
Prothrombin gene mutation (heterozygous)</td></tr>
<tr><td>Acquired
Antiphospholipid antibodies
Persistent lupus anticoagulant and/or persistent Moderate/high titre anticardiolipin antibodies and/or β_2-glycoprotein 1 antibodies</td></tr>
<tr><td colspan="2">Medical comorbidities e.g. cancer, heart failure, active SLE, inflammatory polyarthropathy or IBD, nephrotic syndrome (>3g proteinuria/24 hours), type I diabetes mellitus with nephropathy, sickle cell disease, current intravenous drugs user, PNH</td></tr>
<tr><td colspan="2">Age >35 years</td></tr>
<tr><td colspan="2">Obesity (BMI ≥30) either pre-pregnancy or booking weight</td></tr>
<tr><td colspan="2">Parity ≥3 (a woman becomes para 3 after her third delivery)</td></tr>
<tr><td colspan="2">Smoking</td></tr>
<tr><td colspan="2">Gross varicose veins (symptomatic bilateral or above knee or with associated phlebitis, oedema/skin changes)</td></tr>
<tr><td colspan="2">Paraplegia</td></tr>
<tr><td>Obstetric risk factors</td><td colspan="2">Multiple pregnancy
Current pre-eclampsia</td></tr>
<tr><td></td><td colspan="2">Caesarean section
Prolonged labour (>24 hours)
Mid-cavity or rotational operative delivery
Stillbirth
Preterm birth
Postpartum haemorrhage (>1litre/requiring blood transfusion)</td></tr>
<tr><td rowspan="6">New onset/transient
These risk factors are potentially reversible and may develop at later stages in gestation than the initial risk assessment or may resolve and therefore what is important is an ongoing individual risk assessment</td><td colspan="2">Any surgical procedure in pregnancy or puerperium except immediate repair of the perineum, e.g. appendectomy, postpartum sterilisation
Bone fracture</td></tr>
<tr><td colspan="2">Hyperemesis</td></tr>
<tr><td>Ovarian hyperstimulation syndrome (1st trimester only)</td><td>Assisted reproductive technology (ART), in vitro fertilisation (IVF)</td></tr>
<tr><td>Admission or immobility (≥3 days bed rest)</td><td>e.g. pelvic girdle pain restricting mobility</td></tr>
<tr><td>Current systemic infection (requiring intravenous antibiotics or admission to hospital)</td><td>e.g. pneumonia, pyelonephritis, postpartum wound infection</td></tr>
<tr><td colspan="2">Long distance travel (>4 hours)</td></tr>
</table>

5. Investigation, Diagnosis and Management of Acute DVT

5.1 **Symptoms/signs** of DVT include

- Leg pain
- Leg swelling (usually unilateral) or size discrepancy greater than 2 cm
- Discolouration or superficial collateral veins
- Pain on standing or weight bearing
- Lower abdominal pain (extension of thrombus into pelvic veins or development of collateral circulation)
- Signs or symptoms of Iliac vein thrombosis include: Swelling of entire limb; back and buttock pain, low grade pyrexia or leucocytosis

Classify after assessment as either *low clinical suspicion* or *high clinical suspicion*.

5.2 **Investigate** if clinical signs/symptoms suggestive of DVT

See Flow chart Appendix A

- Do not perform D-dimer testing
  - Levels progressively rise in pregnancy becoming abnormal in healthy women. They are affected by multiple pregnancy, C/S, PPH, PET
  - Retrospective studies are suggestive that a negative D-Dimer is inadequate to exclude PE in pregnancy
- Do not use pretest probability assessments
  - Although Modified Wells scores have been studied in pregnancy further prospective studies are required to validate findings
- Perform baseline bloods- FBC, coagulation, U&E, LFT
- If normal start therapeutic LMWH until DVT definitively excluded (unless contraindicated or test immediately available)
- Perform compression duplex ultrasound
- Negative result and low clinical suspicion *discontinue* LMWH
- Negative result and high clinical index of suspicion *discontinue* LMWH but repeat compression duplex ultrasound 3/7 and 7/7 following presentation. If still negative no need for anticoagulation (negative predictive value of serial ultrasound 99.5%). If unable to repeat imaging at specified times discuss with Consultant. Continuing anticoagulation at this point may make a definitive diagnosis more difficult.
- If DVT confirmed to *continue or recommence* therapeutic anticoagulation
- If iliac vein thrombosis suspected undertake conventional Doppler ultrasound. If unsuccessful or uncertain diagnosis consider either MRI venography or conventional contrast venography

5.3 Management of Confirmed Acute DVT

- Elevate leg initially
- Apply *below knee* graduated elastic compression stocking (ankle pressure greater than 23mmHg) to affected leg to reduce oedema. Not required for unaffected leg.
- Early mobilisation with stocking- no evidence of increased PE risk, reduces pain and may prevent post thrombotic syndrome
- Teach self injection, safe disposal of injections and give sharps bin and patient information leaflet on Treatment of Acute VTE in pregnancy
- Continue therapeutic Anticoagulation with LMWH. Treatment will be required for the remainder of the pregnancy and for 6-12 weeks postnatal and for at least 3 months in total. Duration of treatment will be decided in COH clinic
- If DVT *diagnosed at term or delivery imminent* discuss with Consultant Obstetrician for Haematology – see section 7.4
- Refer to next Combined Obstetric Haematology Antenatal Clinic. For patients at Burton, refer to antenatal clinic run by consultant obstetrician with special interest in venous

thromboembolism in pregnancy in addition to the combined obstetric haematology antenatal clinic at Derby for ongoing anticoagulation plan.
- If under MWLC will need to transfer to CLC

5.4 Post Thrombotic Syndrome

- Prevalence 42% following pregnancy associated DVT
- Greater risk if proximal thrombosis, smoking and age >33yrs
- Symptoms of chronic swelling, pain, heaviness, chronic pigmentation or telangiectasis, eczema, varicose veins and sometimes venous ulceration
- Lower risk if treatment duration longer than 3 months
- Current national guidance is to recommend use of Class 11 graduated compression stockings for 2 years on the affected leg although more recently the effectiveness of this in prevention of PTS has been questioned

6. Investigation of Suspected PE

6.1 Signs/Symptoms of acute PE

The clinical presentation of acute PE can be *varied and atypical* in pregnancy and the presence of risk factors needs to be taken into account together with a careful history and clinical evaluation.

- Small peripheral PE: painless dyspnoea/minimal pain/asymptomatic
- Larger peripheral PE may result in pulmonary infarction and classic pleuritic pain, dyspnoea +/- haemoptysis
- Large central PE: severe SOB, sometimes central chest pain associated with signs of right ventricular dysfunction and maternal cardiorespiratory decompensation or syncope
- Consider if unexplained tachycardia or hypotension
- Atypical may mimic pneumonia with pain +/- fever or follow prolonged LRTI. Clinical presentation may be out of proportion to Xray findings
- Fetal risks relate mainly to alterations in placental perfusion secondary to cardiorespiratory compromise in the mother

6.2 Immediate Assessment and Investigation of Women with Signs/Symptoms of an Acute PE

See Flow chart Appendix B

If Clinically unstable there must be immediate involvement of a senior multidisciplinary team- see section 8 on Management of Massive PE

- Routine maternal and fetal admission observations, RR, Oxygen saturations
- Do not use pretest probability scoring
- Do not use D-Dimer testing
- Auscultate chest, examine for signs DVT
- ECG (all patients) abnormal in 40% of PE
  - T wave inversion 20%
  - S1Q3T3 pattern in 15%
  - RBBB 18%
  - exclude alternative diagnosis (increasing incidence of IHD in pregnancy)
- CXR (all patients) before further imaging with informed consent
  - excludes pneumonia, pneumothorax, lobar collapse.
    - normal in 50% PE
    - Abnormal features seen with PE include atelectasis, effusion, focal opacities, pulmonary oedema
    - discuss radiation dose to fetus negligible (less than 0.01 mSv)
- Consider ABG
  - Limited value unless low oxygen saturations
- Baseline Bloods

- Confirm FBC, coagulation screen, U&E and LFT normal before commencing LMWH
- *Do not take thrombophilia screen as acute thrombus can influence the results*

- If DVT suspected arrange urgent bilateral compression duplex ultrasound to reduce radiation exposure to mother and fetus. If confirmed *no other imaging required and treatment for acute VTE should continue.* A negative result does not exclude PE
- DVT not suspected - image by either V/Q scan or CTPA with informed consent. There is a small false positive rate for both tests. Aim to undertake imaging within 24 hours- if stable it may be appropriate to wait until next day first available list. Unstable patients should be imaged as soon as possible ideally within the first hour– discuss with Consultant Obstetrician and Radiologist on call.

    - V/Q standard first line investigation unless the woman declines (or CTPA indicated as below), especially if there is a FH of breast cancer or the woman has had a previous chest CT scan. For patients at Burton hospital, discuss with the Nuclear Medicine department whether a V/Q scan can be organised at Derby in a timely fashion or to do a Q scan at Burton. It is important to give the full clinical information to Nuclear Medicine team including background chronic chest condition such as asthma, recent viral infection etc.,
    - CTPA should be used first line in preference to V/Q scan if CXR abnormal, suspected massive or submassive PE, urgent diagnosis needed before availability of V/Q scan or women declines V/Q scan but accepts CTPA
    - V/Q scan has a high negative predictive value and a substantially lower radiation dose to breast tissue
    - CTPA can identify other pathology: pneumonia; pulmonary oedema; rarely aortic dissection
    - If V/Q scan indeterminate will require further imaging – discuss with Consultant Radiologist and Obstetrician
    - If indeterminate CTPA discuss with Consultant Respiratory Physician. Indeterminate CTPA is more common in pregnancy due to increased pulmonary flow rates

6.3 Discussion and Consent for Imaging

- Informed consent should be obtained (unless temporary incapacity) before either of these investigations. The woman should be advised that the absolute risk from either investigation is very low. With both techniques the radiation doses are well below accepted levels for teratogenicity, fetal death and fetal growth restriction
- There is a very small increased risk of childhood cancer with V/Q scan.
- There is a lower risk of maternal breast cancer with V/Q scan
- The fetal radiation exposure with CTPA is approximately 0.1mGy compared to 0.5mGy with V/Q scan
- The International Commission on Radiological Protection estimates an increase in the risk of fatal childhood cancer after in utero exposure to be 1 in 17000 per 1mGy exposure which persists up to age 15 yrs
- CTPA has a relatively high radiation dose to maternal breast tissue (up to 20 mGy) - this is 20-100x greater than for V/Q scan. 10 mGy radiation to the breast is estimated to increase the background risk of breast cancer by 13.6%. Breast tissue is especially sensitive to radiation exposure during pregnancy due hormonally induced glandular activity. The risk of breast cancer is greater in younger women

6.4 Management of Confirmed Acute PE

- Continue therapeutic LMWH and manage as outpatient if low risk; normal O2 saturations; normal BP; mild symptoms; low bleeding risk; socially suitable; no other co-morbidities and not a recurrent PE.
- Discuss with Consultant for Obstetric Haematology if at term or imminent delivery or recurrent PE despite anticoagulation– see section 7.4

- Teach safe injection and disposal, provide sharps bin and give patient information leaflet on Treatment of Acute VTE in pregnancy
- Refer to next COH antenatal clinic for ongoing anticoagulation management plan. Treatment will be required for the remainder of the pregnancy and for 6-12 weeks postnatal. Duration of treatment will be decided in COH clinic. For patients at Burton, refer to antenatal clinic run by consultant obstetrician with special interest in venous thromboembolism in pregnancy in addition to the combined obstetric haematology antenatal clinic at Derby for ongoing anticoagulation plan
- Transfer to CLC if under MWLC

7. Anticoagulation Treatment

In clinically suspected DVT or PE treatment with therapeutic doses of LMWH should be commenced immediately until the diagnosis is excluded by objective testing, unless treatment is strongly contraindicated

In women at risk of bleeding LMWH should be postponed until objective testing after consideration of the balance of risks – discuss with Consultant if unsure

7.1 Safety and Efficacy of LMWH

There is substantial evidence of the efficacy of LMWH in treatment of VTE in pregnancy with a low risk of recurrence comparing favourably with the non pregnant population. LMWHs do not cross the placenta and have a lower risk of haemorrhagic complications than unfractionated heparin. The risk of severe PPH is comparable to pregnancies without the use of LMWH. The risk of heparin induced thrombocytopenia (HIT) is very low compared to unfractionated heparin. The risk of heparin induced osteoporosis is 0.04% (2% for unfractionated heparin). LMWH is safe for breastfeeding.

7.2 Therapeutic Doses

- Use booking or early pregnancy weight to calculate dose. If none available use most recent weight
- Start Clexane 1 mg/kg BD. For guidance on most appropriate syringe and volume to eliminate see Table 2a
- If allergic to Clexane use alternative LMWH (see table 2b). Cross reactivity rate 33%. Do not use Warfarin or DOACs (Direct Oral Anticoagulant)

See Table 2 b

- If allergic to all LMWH discuss with Consultant Haematologist – danaparoid can be considered
- If severely reduced Creatinine Clearance (< 30mls/minute) lower doses will be required
  - 15-30mls/minute: 1mg/kg OD
  - <15mls/minute: will require UFH, discuss with haematologist
- If weight > 150 kg discuss with haematologist

The ideal dosing schedule for pregnancy is unclear and there remain concerns about the efficacy of once daily compared to twice daily dosing due to changes in maternal GFR and volume distribution. However there is evidence from observational and national case control studies (UKOSS) that it may be effective.

It is recommended that initial treatment should be with a twice daily regimen.
Suitability for once daily dose schedules will be considered in Combined Obstetric Haematology clinic

- If declines treatment or cannot cope with twice daily injections discuss with Consultant for Obstetric Haematology as once daily doses can be considered.

Table 2a: subcutaneous low molecular weight heparin (LMWH) - Enoxaparin

Patient weight (Kg)	Dose to prescribe (mg)	Injection volume (ml)	Most appropriate syringe (ml)	Volume to be eliminated from syringe prior to injection (ml)
1mg/kg BD: Dose to prescribe TWICE DAILY				
>150	Discuss with Haematologist			
150	150	1.00	Blue syringe 150mg	0
141	141	0.94		0.05
132	132	0.88		0.12
123	123	0.82		0.18
120	120	0.80	Purple syringe 120mg	0
114	114	0.76		0.04
105	105	0.70		0.1
100	100	1.00	Grey syringe 100mg	0
95	95	0.95		0.05
88	87.5	0.875		0.125
82	82.5	0.825		0.175
80	80	0.80	Brown syringe 80mg	0
75	75	0.75		0.05
70	70	0.70		0.10
65	65	0.65		0.15
60	60	0.60	Orange syringe 60mg	0
55	55	0.55		0.05
50	50	0.50		0.10
45	45	0.45		0.15
40	40	0.40	Yellow syringe 40mg	0

Table 2b: Alternative LMWH if allergic to Clexane

Booking/early pregnancy weight (kg)	**Dalteparin**	**Tinzaparin**
<50	5000 IU BD	175 units/kg once daily
50-69	6000 IU BD	
70-89	8000 IU BD	
90-109	10,000 IU BD	
110-125	12,000 IU BD	
>125	Discuss with haematologist	

7.3 Monitoring after Initiation of Treatment Doses LMWH

Routine measurement of peak Anti-Xa levels is only required if

- Less than 50kg or greater than 90kg
- Renal disease with impaired renal function
- Recurrent VTE
- Persistent symptoms
- Large clot burden

There is no need for routine platelet count monitoring unless

- has previously received unfractionated heparin or LMWH in last 100 days
- if so check 24 hrs after initiating treatment

Anti-Xa activity if required is measured 3-4 hours post dose aiming for 0.5-1.2 u/ml.
If this test is needed for Burton patients, contact the haematology lab and send 4 x blue top tubes with the required blood samples

7.4 Peripartum or Recurrent VTE Despite Anticoagulation

Discuss with Consultant for Obstetric Haematology or Consultant Haematologist as it may be necessary to consider temporary IVC filter or rarely intravenous unfractionated heparin

Risk of recurrent VTE is highest within 2 weeks of the initial thrombosis

7.5 High Risk Haemorrhage

If woman has high risk of haemorrhage but anticoagulation considered essential discuss with Obstetric Haematology team as intravenous unfractionated heparin may be preferable

8. Management of Submassive / Massive Life Threatening PE

Acute Massive PE is a medical emergency with a very high mortality. The presentation includes

- Collapse or syncope
- Maternal haemodynamic instability – systolic hypotension < 90mmHg
- Refractory hypoxaemia
- Engorged neck veins
- Right ventricular dysfunction (dilatation and hypokinesis) on transthoracic ECHO

(Refer to Trust guideline for the Management of Massive and Submassive PE on ICU)

Urgent involvement of multidisciplinary team required: on call medical team, on call Consultant Respiratory Physician, Consultant Obs Anaesthetist +/- ICU Consultant, Consultant Radiologist, Consultant Obstetrician

- Resuscitate following principles of ABC
- Bedside ECHO is readily available through ICU and is diagnostic in massive PE (not for submassive although may be prognostically helpful)
- CTPA will be required as soon as possible if patient is stable enough for transfer.
- If Cardiac arrest perform CPR with manual displacement of the uterus
- Perform perimortem Caesarean by 5 minutes if resuscitation unsuccessful and more than 20 weeks pregnant
- Intravenous unfractionated heparin is the preferred initial treatment because of its rapid effect, experience of use in massive PE and ease of adjustment if thrombolytic therapy required
- Consider thrombolytic therapy if life threatening PE with haemodynamic compromise, or limb threatening complications from extensive ileofemoral thrombosis. In this situation anticoagulant therapy alone will not reduce the obstruction in the circulation and thrombolysis has been shown to reduce mortality or risk of recurrent PE
- *If thrombolytic therapy used omit loading dose of iv heparin* and give infusion of heparin after thrombolysis
- If unsuitable for thrombolysis or moribund discussion with cardiothoracic surgeons will be required
- Refer to Trust Guidelines for Use of thrombolysis in Adult Patients with acute PE

8.1 Regimen for Intravenous Unfractionated Heparin

Refer to trust anticoagulation and referral prescription chart

If using unfractionated heparin a Consultant Haematologist should always be involved

- Loading dose 80units/kg (omit if given thrombolysis)
- Continuous infusion 18 units/kg/hour
- Measure APTT 4-6 hours after loading dose or 6 hours after dose change and then daily when in therapeutic range
- Target therapeutic APTT 1.5-2.5 times the laboratory control value. Discuss with Consultant Haematologist
- Dose adjustments as per Trust anticoagulation and referral prescription chart, see Table 3

- Monitor platelet count if postoperative on unfractionated heparin every 2-3 days from Day 4 – 14 or until heparin stopped

Table 3

Adjustment of IV Heparin dose	
APPR Ratio	**Action (if there is no bleeding)**
Under 1.2	Give IV bolus 80 units/kg and increase rate by 4 units/kg/hours
1.2-1.4	Give IV bolus 40 units/kg and increase rate by 2 units/kg/hours
1.5-2.5	No change
3.6-3.0	Reduce rate by 2 units/kg/hour
3.1-4.0	Reduce rate by 3 units/kg/hour
4.1-5.0	Reduce rate by 4 units/kg/hour
5.1-7.0	Stop infusion for one hour. Reduce rate by 5 units/kg/hour
Over 7.0	Stop infusion, repeat APTTR hourly until under 7.0. Reduce rate by 6 units/kg/hour

8.2 Thrombolytic Therapy in Pregnancy

There are a large number of case reports and case series on the use of various agents in pregnancy including: Streptokinase; urokinase; recombinant tissue plasminogen activator (rtPA) and tenecteplase.

The major concerns relate to risk of maternal and fetal bleeding

No maternal deaths related to thrombolytic therapy have been reported
Maternal bleeding complication rates range from 3- 30%, usually from catheter or puncture sites. No reports of maternal ICH
Fetal mortality rates range from 2-15%

9. Maintenance Treatment of Acute VTE

- Continue therapeutic LMWH- this will be required for the remainder of the pregnancy and for a minimum of 6 weeks probably 12 weeks postnatal or until treatment duration complete.
- Inform Consultant Obstetrician of diagnosis- transfer to CLC if under MWLC
- Refer to next Combined Obstetric Haematology (COH) Antenatal clinic or discuss with Consultant from COH if term or peripartum
- Ongoing anticoagulation plans and management for delivery will be discussed in the COH antenatal clinic
- Anaesthetic referral
- Teach self injection and safe disposal of LMWH
- Provide sharps bin
- Give Patient information leaflet on Treatment of Venous thrombosis in pregnancy
- Inform about risk of allergic skin reaction- risk may be as high as 20% and usually delayed type hypersensitivity with median time of onset 50 days. If occurs to discuss with COH Consultant
- Advise woman to withhold Clexane if bleeding, pain, SROM or labour until admitted and assessed
- Reassure woman that bleeding complications are very uncommon whilst on LMWH even if labour occurs
- Outpatient management once clinically stable

10. Management around Labour / Delivery

Individual care plans for anticoagulant management and anaesthesia around delivery will be developed in the Combined Obstetric Haematology clinic in discussion with the woman- see Consultant Management Plan on Lorenzo and Anaesthetic Plan

10.1 General Principles for Management

- Advise woman to withhold injections if she thinks she is in labour and to seek further advice from PAU triage (MAU in Burton)
- Where possible anticoagulation therapy will be altered to avoid unwanted anticoagulant effect during delivery
- If planned delivery by ELSCS discontinue LMWH 24 hrs before (sc heparin 12 hrs, unfractionated 6 hrs)
- IOL – see individual plan but generally 24 hrs before
- Keep well hydrated and mobile as possible
- Senior MW or Obstetrician for delivery to reduce risk of unnecessary perineal or vaginal trauma, operative intervention or bleeding complications
- Active 3rd stage and consider syntocinon infusion depending on risk factors
- Regional anaesthetic techniques require 24 hrs after last dose of LMWH
- LMWH should not be given for 4 hours after spinal anaesthesia or after epidural catheter removal to reduce incidence of spinal haematoma
- The epidural catheter should not be removed within 12 hours of the most recent LMWH injection
- First dose post C/S will usually be a thromboprophylactic dose at 4 hours and treatment dose recommenced 8-12 hrs later

10.2 Surgical Principles

- Consider use of wound drains (abdominal and rectus)
- Use Syntocinon infusion
- Interrupted skin sutures- risk of wound haematoma 9%
- Senior Midwife or Obstetrician for perineal repair to reduce risk of wound breakdown/perineal haematoma

10.3 Haemorrhagic Complications or Significant Bleeding Risk

- If haemorrhagic complications develop on therapeutic LMWH stop treatment and discuss with Consultant Haematologist
- If anticoagulation required and very high bleeding risk discuss with Consultant Haematologist

11. Postnatal Anticoagulation

Women who have been seen in the Combined Obstetric Haematology Clinic will have an individualised care plan for postnatal anticoagulation – see Consultant Management Plan on Lorenzo. (In Burton see Antenatal Care Plan on Meditech V6).This should be followed unless there is a contraindication. If no plan exists discuss duration of anticoagulation with Consultant for Obstetric Haematology

- LMWH is safe for breastfeeding and the agent of choice for most women
- There is an option of changing to Warfarin but this requires regular blood tests so is generally best avoided for short duration anticoagulation. It is also safe for breastfeeding
- Warfarin should not be commenced before Day 5 and ideally postponed until 1-2 weeks postnatal or later if there is an ongoing risk of haemorrhagic complications
- Women who are changing to Warfarin should continue with LMWH and be referred to anticoagulation Clinic as an outpatient
- DOAC s are contraindicated in breast feeding and require the woman to be using reliable contraception. These should only be commenced on the advice of a Consultant Haematologist
- Advise the woman of the importance of continuing anticoagulant therapy in the postnatal period as this is the time when compliance is likely to decrease but risk of recurrence is highest
- Ensure adequate information has been given to GP on discharge

- If the woman has not been seen in the COH clinic in the antenatal period she should be offered an appointment postnatally to plan duration of treatment, discuss contraception and plan future thromboprophylaxis needs.

12. Monitoring Compliance and Effectiveness

As per agreed business unit audit forward programme

13. References

1. RCOG. Thromboembolic disease in pregnancy and the puerperium: acute management. Green-top guideline No. 37b. April 2015

2. MBRRACE-UK. Saving Lives, Improving Mother's Care 1st Nov 2018. Lessons learned to inform Maternity Care from the UK and Ireland Confidential Enquires into Maternal Deaths and Morbidity 2014-16

British Thoracic Society Guideline for the initial outpatient management of pulmonary embolism (PE) Howard LSGE et al. Thorax 2018; 73:ii1-ii29.doi:10.1136/thoraxjnl- 2018-211539

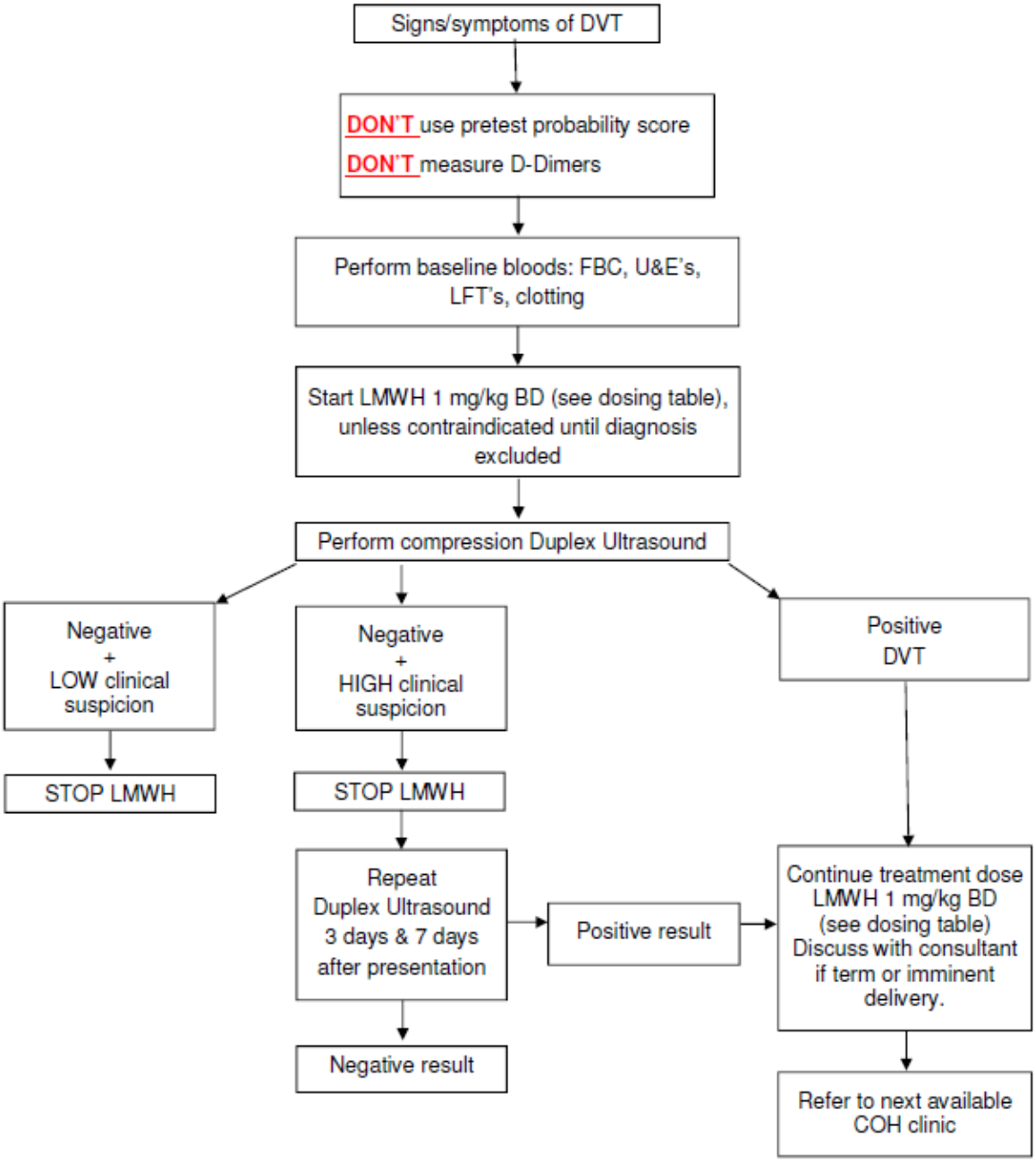
Pulmonary Embolus- Assessment and Imaging – Suspected Acute PE – full clinical guideline CG-T/2013/051

Guideline for the Management of Massive and Submassive Pulmonary Embolus on ICU Guidelines for the Use of Thrombolysis in Adult Patients with an acute Pulmonary embolus CG-T/2010/135

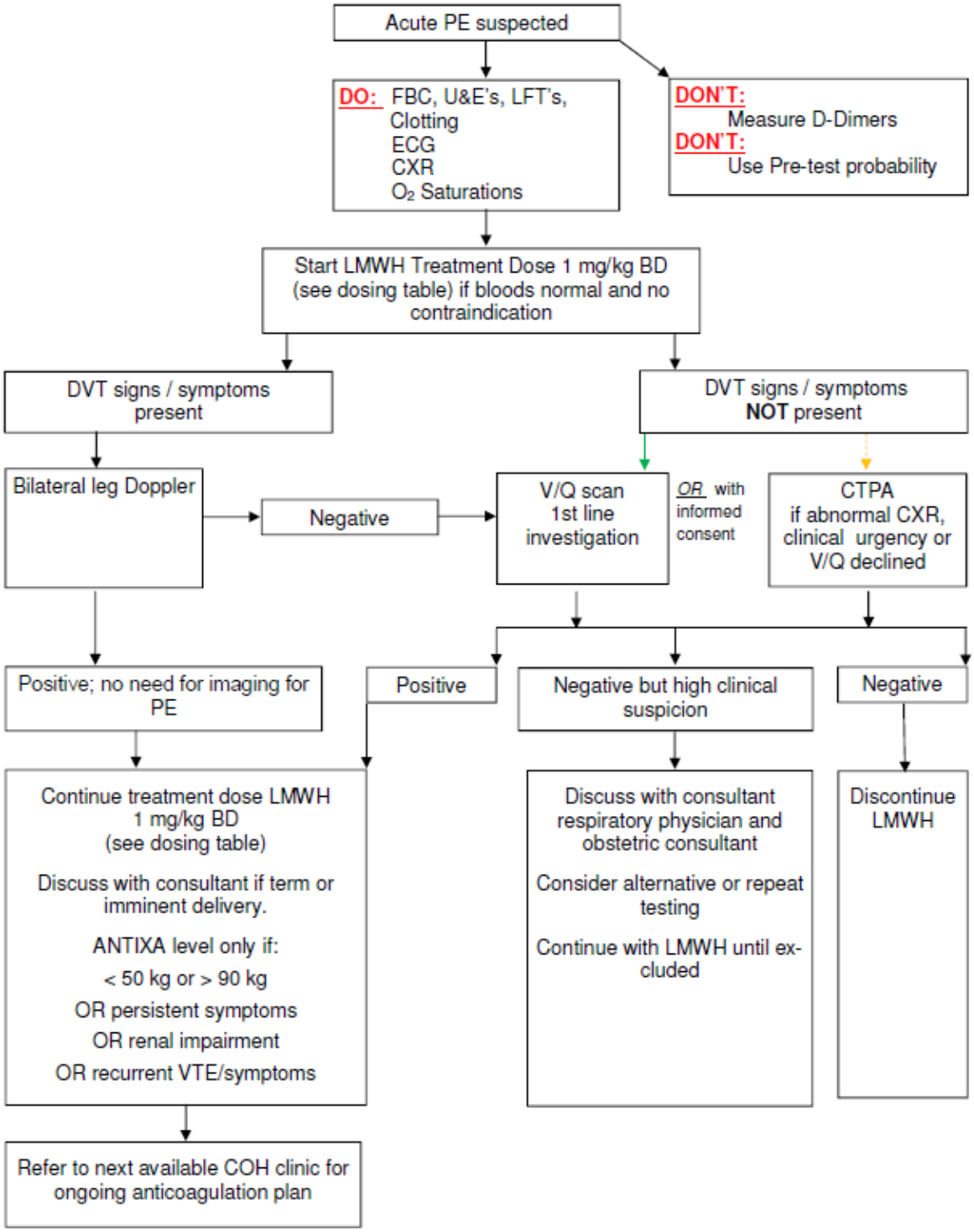
14. Recommendations for future Audit

- Audit of all VTE in pregnancy to identify avoidable HAT and allow Duty of Candour
- Correct management of proven VTE
- Appropriate recommencement of postnatal anticoagulation
- Management of women initially presenting outside of obstetric service
- Patient information on diagnosis

APPENDIX A


Signs/symptoms of DVT
DON'T use pretest probability score
DON'T measure D-Dimers
Perform baseline bloods: FBC, U&E's, LFT's, clotting
Start LMWH 1 mg/kg BD (see dosing table), unless contraindicated until diagnosis excluded
Perform compression Duplex Ultrasound
Negative + LOW clinical suspicion
Negative + HIGH clinical suspicion
Positive DVT
STOP LMWH
STOP LMWH
Repeat Duplex Ultrasound 3 days & 7 days after presentation
Positive result
Continue treatment dose LMWH 1 mg/kg BD (see dosing table) Discuss with consultant if term or imminent delivery.
Negative result
Refer to next available COH clinic

APPENDIX B


Acute PE suspected
DO: FBC, U&E's, LFT's, Clotting ECG CXR O_2 Saturations
DON'T: Measure D-Dimers
DON'T: Use Pre-test probability
Start LMWH Treatment Dose 1 mg/kg BD (see dosing table) if bloods normal and no contraindication
DVT signs / symptoms present
DVT signs / symptoms NOT present
Bilateral leg Doppler
Negative
V/Q scan 1st line investigation
OR with informed consent
CTPA if abnormal CXR, clinical urgency or V/Q declined
Positive; no need for imaging for PE
Positive
Negative but high clinical suspicion
Negative
Continue treatment dose LMWH 1 mg/kg BD (see dosing table)
Discuss with consultant if term or imminent delivery.
ANTIXA level only if:
< 50 kg or > 90 kg
OR persistent symptoms
OR renal impairment
OR recurrent VTE/symptoms
Discuss with consultant respiratory physician and obstetric consultant
Consider alternative or repeat testing
Continue with LMWH until excluded
Discontinue LMWH
Refer to next available COH clinic for ongoing anticoagulation plan

University Hospitals of Derby and Burton NHS Foundation Trust

Patient information

Diagnosis and treatment of venous thrombosis in pregnancy and after birth

Who is this information for?

This information is for you if you think you may have, or have already been diagnosed with, a venous thrombosis or pulmonary embolism while pregnant or just after birth. You may also find it helpful if you are the partner or a relative of a woman in this situation.

If you have would like information on how to reduce your risk of a venous thrombosis, please ask your midwife or obstetrician.

What is venous thrombosis?

A thrombosis is a blood clot in a blood vessel (a vein or an artery). Venous thrombosis occurs in a vein. Veins are the blood vessels that take blood back to the heart and lungs whereas arteries take the blood away.
A deep vein thrombosis (DVT) is a blood clot that forms in a deep vein of the leg, calf or pelvis.

How common is it in pregnancy?

Pregnancy increases your risk of a DVT, with the highest risk being just after you have had your baby. However, venous thrombosis is still uncommon in pregnancy or in the first 6 weeks after birth, occurring in only 1–2 in 1000 women.

A DVT can occur at any time during your pregnancy, including the first 3 months.

What are the symptoms of a DVT during pregnancy?

The symptoms of a DVT usually occur in only one leg and can include:

- a red and hot swollen leg
- swelling of your entire leg or just part of it, or it may just feel heavy
- pain and/or tenderness – you may only experience this when standing or walking

You should seek advice immediately from your doctor or midwife if you notice any of these symptoms.

During pregnancy, swelling and discomfort in both legs is common and does not always mean that there is a problem. Ask your doctor or midwife if you are worried.

Why is a DVT serious?

Venous thrombosis can be serious because the blood clot may break off and travel in the bloodstream until it gets lodged in another part of the body, such as the lung. This is called a pulmonary embolism (PE) and can be life threatening. However, dying from a PE is very rare in women who are pregnant or who have just had a baby.
The symptoms of a PE can include:

- sudden unexplained difficulty in breathing
- tightness in the chest or chest pain
- coughing up blood (haemoptysis)
- feeling very unwell or collapsing.

You should seek help immediately if you experience any of these symptoms. Diagnosing and treating a DVT reduces the risk of developing a PE.

What increases my risk of DVT or PE?

You are at increased risk of venous thrombosis if any of the following apply to you.

- **Before pregnancy**
  If you:
  - are over 35 years of age
  - have already had three or more babies
  - have had a previous venous thrombosis
  - have a mother, father, brother or sister who has had a venous thrombosis
  - have a thrombophilia (a condition that makes a blood clot more likely)
  - have a medical condition such as heart disease, lung disease or arthritis – your doctor or midwife will be able to tell you whether any medical condition you have increases your risk of a DVT/PE
  - have severe varicose veins that are painful or above the knee with redness/swelling
  - are a wheelchair user
- Lifestyle
  If you:
  - are overweight with a body mass index (BMI) over 30
  - are a smoker
  - use intravenous drugs
- During pregnancy
  If you:
  - are admitted to hospital
  - are carrying more than one baby (multiple pregnancy)
  - become dehydrated or less mobile in pregnancy due to, for example, vomiting in early pregnancy, being in hospital with a severe infection such as appendicitis or a kidney infection or if you are unwell from fertility treatment (ovarian hyperstimulation syndrome)
  - are immobile for long periods of time, for example after an operation or when travelling for 4 hours or longer (by air, car or train)
  - have pre-eclampsia
- After the birth of your baby
  If you:
  - have a very long labour (more than 24 hours)
  - have had a caesarean section
  - lose a lot of blood after you have had your baby or receive a blood transfusion

You should have a risk assessment during pregnancy and after you have had your baby during which your doctor or midwife will ask whether you have any of the risk factors above.

How are DVT and PE diagnosed during pregnancy?

DVT

If you are experiencing symptoms, your doctor will examine your leg and may recommend an ultrasound scan of your leg to see whether you have a thrombosis. If no thrombosis is seen but you are still having symptoms, the ultrasound scan may be repeated a few days later.

PE

The tests may include:

- a chest X-ray – this can also identify common problems that could be the cause of your symptoms, such as a chest infection
- a VQ scan (ventilation/perfusion scan) of your lungs – this involves a drip into a vein in your arm
- a CT scan (specialised X-ray) of your lungs
- an ultrasound scan of both your legs if you have any symptoms of a DVT.

Are there any risks with having the tests?

The chest X-ray, CT scan and VQ scan all use radiation. The chest X-ray uses a tiny dose of radiation that is not considered harmful for you or your baby.

The CT and VQ scans both carry a small risk but this needs to be weighed up against the risk to you and your baby of an undiagnosed PE. The risk to your baby of developing childhood cancer after a VQ scan or a CT scan is extremely low although it is slightly higher with a VQ scan than with a CT scan.

However, a CT scan gives a higher dose of radiation to your breasts than a VQ scan and the lifetime risk of breast cancer may be increased. Your doctor will talk to you about the benefits and risks and which test would be best for you.

What is the treatment for venous thrombosis?

If your doctor suspects that you have a venous thrombosis, you will be advised to start on treatment with an injection of a drug called heparin to thin the blood. There are various types of heparin. The most commonly used in pregnancy is low-molecular-weight heparin (LMWH).

For most women, the benefits of heparin are that it:

- works to prevent the clot getting any bigger so your body can gradually dissolve the clot
- reduces the risk of a PE
- reduces the risk of another venous thrombosis developing
- lowers the risk of long-term problems developing in the leg

What does heparin treatment involve?

Heparin is given as an injection under the skin (subcutaneous) at the same time every day (sometimes twice daily). The dose is worked out for you according to your weight in early pregnancy.

You may not need to stay in hospital for the whole duration of treatment with heparin. You (or a family member) will be shown how and where in your body to give the injections. Needles and syringes (already made up) will be provided and you will be

given advice on how to store and dispose of these. You will have regular check-ups as an outpatient.

Are there any risks to my baby and me from heparin?

Low-molecular-weight heparin does not cross the placenta and therefore cannot harm your baby.

There may be some bruising where you inject – this will usually fade in a few days.

One or two women in every 100 (1–2%) will have an allergic reaction. If you notice a rash after injecting, you should inform your doctor so that the type of heparin can be changed.

How long will I need to take heparin?

Treatment is usually recommended for the remainder of your pregnancy and for at least 6-12 weeks after the birth. There is a choice of treatment after birth of continuing with injections of heparin or using warfarin tablets. Your doctor will discuss your options with you. The minimum treatment time is 3 months and you may need to continue it for longer.

After diagnosis

What else can I do to help if I have a DVT?

- Stay as active as you can
- You will be prescribed a special stocking (graduated elastic compression stocking) to wear, which helps to reduce the swelling in the leg
- If you need pain relief, ask your doctor or midwife

What should I do when labour starts?

If you think you are going into labour, do not have any more injections. Phone your maternity unit and tell them you are on heparin treatment. They will advise you what to do.

An epidural injection (a regional anaesthetic injection given into the space around the nerves in your back to numb your lower body) cannot be given until 24 hours after your last heparin injection. You will have the option of alternative pain relief.

If the plan is to induce labour, you should stop your injections 24 hours before the planned date.

What if I have a caesarean section?

If you are having a planned caesarean section, your last heparin injection should be 24 hours before the planned delivery. Heparin will usually be restarted within 4 hours of the operation.

If your baby needs to be born by emergency caesarean section within 24 hours of your last injection, you will not be able to have an epidural or spinal injection. Instead you will need a general anaesthetic for your operation.

What happens after birth?

Treatment should be continued for at least 6-12 weeks after birth. You are likely to need treatment for longer if your DVT or PE was diagnosed late in pregnancy or after birth.

After the diagnosis of a thrombosis you will usually be given an appointment with an obstetrician and haematologist. At your appointment the doctors will:

- discuss your treatment and plans for delivery and after birth
- ask about your family history of thrombosis and discuss tests for a condition that makes thrombosis more likely (thrombophilia) – these tests should be done when you have stopped treatment and ideally before any future pregnancies
- discuss your options for contraception – you should be advised not to take any contraception that contains estrogen, such as the 'combined pill'
- discuss future pregnancies – you will usually be recommended heparin treatment during and after your next pregnancy.
- Discuss prevention of thrombosis at other times of risk outside of pregnancy

Can I breastfeed?

Yes – both heparin and warfarin are safe to take when breastfeeding.

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