Guideline for the Diagnosis and Treatment of Thromboembolic Disease in Pregnancy and the Puerperium

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1.0 Introduction

Thrombosis and thromboembolism are the leading causes of direct maternal death during or up to six weeks after the end of pregnancy. This has been the case for 20 years. In the most recent MBRRACE report they accounted for 15% of maternal deaths between 2016 and 2018. Women already receiving thromboprophylaxis can still develop thromboembolism. Vigilance and consistency in the diagnosis and management of thromboembolic disease is therefore imperative.

The subjective clinical assessment of deep venous thrombosis (DVT) and pulmonary embolism (PE) is particularly unreliable in pregnancy and only a minority of women with clinically suspected venous thromboembolism (VTE) have the diagnosis confirmed when objective testing is employed; the prevalence of diagnosed PE in pregnant women with suspected PE is 2–6%. The risk of antenatal VTE is four to five-fold higher in pregnant women than in non-pregnant women of the same age, although the absolute risk remains low at around 1 in 1000 pregnancies. VTE can occur at any stage of pregnancy but the puerperium is the time of highest risk, with estimates of relative risk of approximately 20 fold.

2.0 Objective

This document provides a framework for assessment and management of VTE in pregnancy and the immediate postnatal period. It will also be used for those who have a VTE and have a miscarriage or an ectopic pregnancy.

3.0 Scope

This guideline applies to all medical and midwifery staff working within Women's services.

4.0 Main body of the document

Acute VTE should be suspected during pregnancy in women with symptoms consistent with possible VTE, particularly if there are other risk factors for VTE.

4.1 Signs and symptoms

Signs and symptoms of DVT

- Leg pain and discomfort
- Swelling, tenderness and oedema (usually unilateral)
- Lower abdominal pain (reflecting extension of thrombus into the pelvic vessels and/or development of a collateral circulation)

Signs and Symptoms of PE

- Dyspnoea
- Chest pain
- Haemoptysis
- Maternal collapse

NB A low-grade pyrexia and leucocytosis can occur with VTE

4.2 Investigations

Investigations for the diagnosis of an acute DVT
Compression duplex ultrasound

If ultrasound is negative and there is a low level of clinical suspicion, anticoagulant treatment can be discontinued.

If ultrasound is negative and there is a high level of clinical suspicion, anticoagulant treatment should be discontinued but the ultrasound should be repeated on days three and seven.

Investigations for the diagnosis of an acute pulmonary embolism (PE)

- Electrocardiogram (ECG) and a chest X-ray (CXR)
- Compression duplex ultrasound if PE suspected with additional DVT symptoms. If the ultrasound is positive no further investigation is necessary and treatment for VTE should be commenced.
- A ventilation/perfusion lung scan (V/Q) or a computerised tomography pulmonary angiogram (CTPA) is recommended if PE suspected with no DVT symptoms. This must be discussed with the radiologist on call, requested on ICE and consent completed and filed in the notes. Follow the link to the consent form Imaging Request for Suspected PE in pregnancy.
- A CTPA will be performed in preference to a V/Q scan in women with an abnormal chest x-ray and a clinical suspicion of PE
- Alternative or repeat testing should be carried out where V/Q scan or CTPA is normal or inconclusive, but the clinical suspicion of PE remains
- Anticoagulant treatment should be continued until PE is definitively excluded. These cases must be discussed with a radiologist and the obstetric consultant
- D-dimer testing should not be performed in the investigation of acute VTE in pregnancy
- At present, there is no evidence to support the use of pre-test probability assessment in the management of acute VTE in pregnancy

All appropriate options for investigations will be discussed with the woman prior to requesting and informed consent will be gained. Women will be informed that:

- VQ scanning carries a slightly higher risk of causing childhood cancer compared with CTPA.
- In both techniques the doses of radiation employed are well below the accepted thresholds for teratogenicity, fetal death and fetal growth restriction. The international Commission on Radiological protection has estimated an increased risk of fatal childhood cancer to the age of 15 following in utero radiation exposure of 0.006% per mGy (1 in 17000 per mGy). The fetal radiation exposure associated with CTPA is 0.1 mGy and V/Q is 0.5 mGy.

	V/Q scan	CTPA scan	Natural risk
What is the risk of causing childhood cancer	1 in 100,000 to 1 in 10,000	1 in 1,000,000 to 1 in 100,000	1 in 500
What are the risks of causing significant hereditary disease	1 in 435,000	1 in 5,500,000	1 in 50
Data from HPA report: Protection of pregnant Patients during Diagnostic medical Exposures to Ionizing Radiation (2009)			

- Breast tissue is more sensitive to radiation exposure in pregnancy. The radiation dose for a CTPA scan can be 20 to 100 times greater than the radiation dose from a V/Q scan. The delivery of 10mGy of radiation to a woman's breast has been estimated to increase their lifetime risk of developing breast cancer by 13.6% above her background risk. E.g. A 25 year old woman whose background risk of developing breast cancer in the next 10 years is 0.1% will have an increased risk from 10mGy of radiation of 13.6% of 0.1% which is 0.0136%. Radiation doses to the breast tissue can be reduced by using bismuth shields

Baseline blood investigations

- Before anticoagulant therapy is commenced, blood should be taken for a full blood count, coagulation screen, urea and electrolytes, and liver function tests
- Thrombophilia screen prior to therapy is not recommended

4.3 Management of massive life-threatening PE in pregnancy and the puerperium.

- Dial 2222 and ask for the cardiac arrest team and obstetric emergency team
- Assessment of basic life support requirements will be made and implemented as appropriate
- An urgent portable echocardiogram or CTPA within 1 hour of presentation should be arranged
- These patients will be cared for on BBC enhanced care / ITU, dependent on the woman's condition
- Management should involve a multidisciplinary team including senior physicians, obstetricians and radiologists

- Women should be managed on an individual basis with consideration given to intravenous unfractionated heparin, thrombolytic therapy or thoracotomy and surgical embolectomy.

- Intravenous unfractionated heparin is the preferred initial treatment in massive PE with cardiovascular compromise
- Assessment of the baby and viability will be done and a plan for delivery reviewed once the woman is stable enough

4.4 Treatment

Initial anticoagulant treatment of VTE in pregnancy

If DVT or PE is clinically suspected, treatment with LMWH should be commenced immediately until the diagnosis is excluded by objective testing, unless treatment is strongly contraindicated. This will be decided by the obstetric team.

LMWH should be given in doses titrated against the woman's booking or early pregnancy weight. There is insufficient evidence to recommend whether the dose of LMWH should be given once daily or in two divided doses.

Treatment of VTE in pregnancy

Maternal weight at booking	**Dose of Dalteparin**	
	Morning Dose	**Evening Dose**
< 50kgs	5,000 units	5,000 units
50 - 64kgs	7,500 units	5,000 units
65 - 79kgs	7,500 units	7,500 units
80 - 94kgs	10,000 units	7,500 units
95 – 109kgs	10,000 units	10,000 units
110 – 124kgs	12,500 units	10,000 units
125 – 139kgs	12,500 units	12,500 units
140 – 154kgs	15,000 units	12,500 units
155 – 169kgs	15,000 units	15,000 units

Routine measurement of peak anti-Xa activity for patients on LMWH for treatment of acute VTE in pregnancy or postpartum is only recommended in women at extremes of body weight (less than 50 kg and **90 kg or more**) or with other complicating factors e.g. renal impairment or recurrent VTE.

Routine platelet count monitoring should not be carried out, unless there is previous exposure to unfractionated heparin.

In the initial management of DVT, the leg should be elevated and TED stockings applied to reduce oedema. Mobilisation with TED stockings should be encouraged

Consideration should be given to the use of a temporary inferior vena cava filter in the peripartum period for patients with iliac vein VTE to reduce the risk of PE or in patients with proven DVT and who have recurrent PE despite adequate anticoagulation. This should be discussed with the Consultant Haematologist on call.

Thrombolysis or surgical embolectomy should be considered for pregnant women who are clinically unstable as a result of a PE and also those with an extensive DVT.

Administration and management of IV Unfractionated Heparin

- Check baseline coagulation and immediately start Heparin treatment.
- Give bolus loading dose of 5000 units by intravenous injection.
- Draw up 30mls of PUMP-HEP into a 50ml syringe and infuse via syringe pump at 1.3ml / hour. (30,000 units over 24 hours) **Do not dilute PUMP-HEP.**
- Titrate the infusion rate to achieve the therapeutic range (see below). Aim for therapeutic level (PTT ratio 1.7 – 3.0) as quickly as possible, but definitely within 24 hours of starting Heparin.

Variable rates for PUMP-HEP (1000 units / ml)

PTT Ratio	**Infusion Rate change**
>7	Stop for 2 hours and re-check PTT At re-start reduce rate by 0.5ml / hr
5.1 – 7.0	Reduce by 0.5ml / hr
4.1 – 5.0	Reduce by 0.3ml / hr
3.1 – 4.0	Reduce by 0.1ml / hr
1.7 – 3.0	No change
1.2 – 1.6	Increase by 0.2ml / hr
<1.2	Increase by 0.4ml / hr

- Check PTT ratio 4 – 6 hours after starting infusion
- Repeat PTT ratio every 6 hours after each alteration in rate unless PTT ratio is >5 in which case, measurements should be made more frequently.
- Postoperative woman (pregnant and postnatal) who are receiving unfractionated heparin should have platelet count monitoring performed every 2–3 days from days 4 to 14 or until heparin is stopped

Management of bleeding when on intravenous Heparin

- Stop Heparin and send sample for PTT ratio, as half-life of Heparin is short this is usually sufficient.
- If the bleeding is severe or life-threatening give Protamine Sulphate by slow intravenous injection in a dose of 1mg for every 100 units (0.1ml PUMP-HEP) Heparin infused over the previous **hour** (maximum 50mg).
- Following administration of Protamine sulphate, repeat the PTT

Involve the Haematologist if bleeding continues for ≥ 1 hour after stopping the Heparin or after the administration of protamine sulphate.

Maintenance treatment of VTE

- Treatment with therapeutic doses of subcutaneous LMWH should be started when APTT ratio is stable.
- Therapeutic LMWH should be continued during the remainder of the pregnancy and for at least 6 weeks postnatally and until at least 3 months of treatment has been given in total.
- Women should be taught to self-inject LMWH and arrangements made to allow safe disposal of needles and syringes.
- Outpatient follow-up should include clinical assessment and advice with monitoring of blood platelets and peak anti-Xa levels if appropriate (NB remember this needs to be carried out for women over 90kg).
- Pregnant women who develop heparin-induced thrombocytopenia or have heparin allergy and require continuing anticoagulant therapy should be managed with an alternative anticoagulant under specialist advice

Anticoagulant therapy during labour and birth

- When VTE occurs at term, consideration should be given to the use of intravenous unfractionated heparin which is more easily manipulated
- Where birth is planned, either by elective caesarean birth or induction of labour, LMWH maintenance therapy should be discontinued 24 hours prior to the planned date
  A consultant should review and prioritise women for induction of labour, if they are prescribed either prophylactic or treatment dose anticoagulation in order to reduce the time these women are not receiving LMWH
- Women on LMWH should be advised to stop their heparin, and inform a midwife/doctor, once they are established in labour or think that they are in labour
- Where possible, regional anaesthetic should not be undertaken until at least 24 hours after the last dose of therapeutic LMWH
- LMWH should not be given for four hours after the use of spinal anaesthesia or after the epidural catheter has been removed, and the epidural catheter should not be removed within 12 hours of the most recent injection
- In patients receiving therapeutic doses of LMWH, wound drains (abdominal and rectus sheath) should be considered at caesarean birth and the skin incision should be closed with interrupted sutures to allow drainage of any haematoma.

Women at high risk of haemorrhage

Any woman who is at high risk of haemorrhage who requires continued heparin should be treated with intravenous unfractionated heparin.

Postnatal anticoagulation

- Therapeutic anticoagulant therapy should be continued for at least six weeks postnatally and until at least three months of treatment has been given in total. Before discontinuing treatment, the continuing risk of thrombosis should be assessed.
- Offer a choice of LMWH or oral anticoagulant for postnatal therapy. The woman should be made aware of the need for regular blood tests if oral anticoagulant therapy (Warfarin) is given, particularly during the first 10 days of treatment. Direct oral anticoagulants may be considered for use in women who have chosen not to breastfeed.
- Postpartum warfarin should be avoided until at least the fifth day and for longer in women at increased risk of postpartum haemorrhage.
- Heparin (unfractionated or LMWH) or warfarin are not contraindicated in breastfeeding

Treatment dose for postnatal patients with VTE

Maternal weight at booking	**Dalteparin dose**
<45kg	7,500 units ONCE daily
45 – 56kgs	10,000 units ONCE daily
57 – 68kgs	12,500 units ONCE daily
69 – 82kgs	15,000 units ONCE daily
83 – 100kgs	18,000 units ONCE daily
For patients weighing more than 100kg, the dose is split and administered twice daily, as below	
101 – 115kgs	10,000 units **TWICE** daily
116 – 140kgs	12,500 units **TWICE** daily
>140kgs	15,000 units **TWICE** daily

Prevention of post-thrombotic syndrome

- Advise that prolonged use of LMWH (more than 12 weeks) is associated with a significantly lower chance of developing post-thrombotic syndrome.
- Following a DVT, TED stockings should be worn on the affected leg to reduce pain and swelling. The role of compression stockings in the prevention of post-thrombotic syndrome is unclear.

4.4 Postnatal clinic review

Postnatal review for patients who develop VTE during pregnancy or the puerperium should, whenever possible, be in the Antenatal Clinic. Postnatal management should involve discussion with a haematologist.

Thrombophilia testing should be performed, once anticoagulant therapy has been discontinued, only if it is considered that the results would influence the woman's future management.

5.0 Roles and responsibilities

5.1 Midwives

To provide care for women in accordance with this guideline.

5.2 Obstetricians

To provide care for women in accordance with this guideline.

5.3 Paediatricians

To attend delivery when their presence is requested.

5.4 Anaesthetists

To attend when their presence is requested and provide analgesia/anaesthesia to the women for operations and procedures as appropriate.

6.0 Associated documents and references

Thromboprophylaxis guideline for obstetric women.pdf (trent.nhs.uk)
MBRRACE-UK_Maternal_Report_2021_-_FINAL_-_WEB_VERSION.pdf (ox.ac.uk)
Thrombosis and Embolism during Pregnancy and the Puerperium: Acute Management (Green-top Guideline No. 37b) | RCOG

7.0 Training and resources

Training will be delivered as outlined in the Maternity Training Needs Analysis. This is updated on an annual basis.

8.0 Monitoring and audit

Any adverse incidents relating to the guideline for thromboembolic disease in pregnancy and the puerperium will be monitored via the incident reporting system. Any problems will be actioned via the case review and root cause analysis action plans. The action plans are monitored by the risk midwife to ensure that improvements in care are made. The trends and any root cause analysis are discussed at the monthly risk meetings to ensure that appropriate action has been taken to maintain safety.

The guideline for thromboembolic disease in pregnancy and the puerperium will be audited in line with the annual audit programme, as agreed by the CBU. The audit action plan will be

reviewed at the monthly risk management meetings on a quarterly basis and monitored by the risk midwife to ensure that improvements in care are made.

9.0 Equality and Diversity

This section is mandatory for all Trust Approved Documents and must include the statement below:

The Trust is committed to an environment that promotes equality and embraces diversity in its performance as an employer and service provider. It will adhere to legal and performance requirements and will mainstream equality, diversity and inclusion principles through its policies, procedures and processes. This guideline should be implemented with due regard to this commitment.

To ensure that the implementation of this guideline does not have an adverse impact in response to the requirements of the Equality Act 2010 this policy has been screened for relevance during the policy development process and a full equality impact assessment is conducted where necessary prior to consultation. The Trust will take remedial action when necessary to address any unexpected or unwarranted disparities and monitor practice to ensure that this policy is fairly implemented.

This guideline can be made available in alternative formats on request including large print, Braille, moon, audio, and different languages. To arrange this please refer to the Trust translation and interpretation policy in the first instance.

The Trust will endeavor to make reasonable adjustments to accommodate any employee/patient with particular equality, diversity and inclusion requirements in implementing this guideline. This may include accessibility of meeting/appointment venues, providing translation, arranging an interpreter to attend appointments/meetings, extending policy timeframes to enable translation to be undertaken, or assistance with formulating any written statements.

9.1 Recording and Monitoring of Equality & Diversity

This section is mandatory for all Trust Approved Documents and must include the statement below:

The Trust understands the business case for equality, diversity and inclusion and will make sure that this is translated into practice. Accordingly, all policies/guidelines/procedures will be monitored to ensure their effectiveness.

Monitoring information will be collated, analysed and published on an annual basis as part of Equality Delivery System. The monitoring will cover the nine protected characteristics and will meet statutory employment duties under the Equality Act 2010. Where adverse impact is identified through the monitoring process the Trust will investigate and take corrective action to mitigate and prevent any negative impact.

Appendix 1
Equality Impact Assessment – required for policy only
Please refer to Equality Impact Assessment Toolkit – found in Corporate Templates on PC desktop.
For clinical policies use Rapid Equality Impact Assessment Form
For all other policies use Equality Impact Assessment Blank Template

Appendix 2
Glossary of terms
List all terms/acronyms used within the document and provide a summary of what they mean.

Appendix 3 (must always be the last appendix)
Maintain a record of the document history, reviews and key changes made (including versions and dates)

Version	Date	Comments	Author

Review Process Prior to Ratification:

Name of Group/Department/Committee	Date
Reviewed by Maternity Guideline Group	
Reviewed at Women's Business and Governance meeting	
Approved by CBU 3 Overarching Governance Meeting	
Approved at Trust Clinical Guidelines Group	
Approved at Medicines Management Committee (if document relates to medicines)	N/A

Trust Approved Documents (policies, clinical guidelines and procedures)

Approval Form

Please complete the following information and attach to your document when submitting a policy, clinical guideline or procedure for approval.

Document type (policy, clinical guideline or procedure)	Guideline
Document title	Guideline for the Treatment of Thromboembolic disease in Pregnancy and the Puerperium
Document author (Job title and team)	Dr E Long ST6, Dr Fawzy consultant, Dr Khanem consultant, G Dunning midwife
New or reviewed document	Reviewed
List staff groups/departments consulted with during document development	
Approval recommended by (meeting and dates):	**WB&G 18/11/22** **CBU3 B&G 21/12/22**
Date of next review (maximum 3 years)	21/12/25
Key words for search criteria on intranet (max 10 words)	VTE, Dalteparin, Fragmin, blood clot
Key messages for staff (consider changes from previous versions and any impact on patient safety)	
I confirm that this is the FINAL version of this document	**Name:** **Designation:**

FOR COMPLETION BY THE CLINICAL GOVERNANCE TEAM

Approved by (group/committee): CBU3 Business and Governance
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