OBSTETRICS AND GYNAECOLOGY
CLINICAL PRACTICE GUIDELINE

Venous thromboembolism (VTE): Prevention and management

Scope (Staff):	Obstetrics and Gynaecology Directorate staff
Scope (Area):	KEMH and OPH

This document should be read in conjunction with this Disclaimer

Contents

Background

Venous thromboembolism (VTE) due to deep vein thrombosis (DVT) and/or pulmonary embolism (PE) is a major health concern associated with significant mortality and morbidity. This includes the sequelae of post-thrombotic chronic venous insufficiency, pulmonary hypertension, recurrent thrombosis or death.[1, 2] Pulmonary embolism is one of the leading causes of preventable death in hospitalised patients.

An estimated 1 in 1000 Australians are diagnosed with VTE each year. Risk factors for VTE include hospitalisation with bed rest, dehydration, vascular injury from surgery or trauma[1], pregnancy, increasing age, length of hospital stay and a current or previous history of cancer. See further risk factors in 'Risk Assessment' chapter of this guideline.

Death from PE and morbidity as a result of VTE acquired in hospital is potentially preventable if appropriate VTE prophylaxis is used during and after hospitalisation.[1] Thromboprophylaxis refers to mechanical and/or pharmacological treatment administered to reduce the probability of VTE. The rationale for such treatment is based on the high prevalence of VTE in hospitalised patients, the serious adverse consequences of VTE and the efficacy and cost-effectiveness of prophylaxis.

Updates in 2021

Several clinical guidelines relating to VTE prevention and treatment at KEMH were reviewed and amalgamated into one new VTE Prevention and Management guideline. Relevant sections and hyperlinks to the ACSQHC Venous Thromboembolism Prevention Clinical Care Standard (2020) and to mechanical prophylaxis in the SCGH guideline have been added. Refer to Obstetrics and Gynaecology Directorate Guideline updates to see further practice changes and details.

Prophylaxis and prevention

VTE prevention clinical care standard

The Australian Commission on Safety and Quality in Health Care (ACSQHC) has developed a clinical care standard to assist Australian hospitals in addressing priority areas of quality improvement for VTE prevention.

At WNHS, provide VTE prophylactic care in accordance with the ACSQHC Venous Thromboembolism (VTE) Prevention Clinical Care Standard (Jan 2020) (external website, PDF, 6.8MB).

Additional resources:

- Clinician Fact Sheet (external website, PDF, 131KB)
- Consumer Fact Sheet Quick Facts (external website, PDF, 189KB)
- Resources (external website) and Medication Chart VTE Prophylaxis Tools (external website)

Note- If any hyperlinks to ACSQHC resources are not working in Internet Explorer- try copying the link to a different browser (e.g. Edge or Chrome).

ACSQHC VTE clinical care standard (CCS) scope

The ACSQHC VTE clinical care standard is not intended to cover all patients and clinical situations. Clinicians are to use clinical judgement and individualise management to patient needs when applying information from within the clinical care standard in the link above. Information in the AQSCHC standard relates to pharmacological and mechanical methods of VTE **prevention** in patients ≥18 years who are:

- **Pregnant** (or given birth in past six weeks): Antenatal or perinatal care
- **Admitted**: To a ward/unit in preceding 24 hours
- **Admitted to day surgery with** significantly reduced mobility compared to normal state or require prolonged anaesthesia or have multiple risk factors for VTE
- **Discharged** from emergency department with significantly reduced mobility (e.g. immobilisation with plaster/brace)

General principles of VTE prevention CCS

Venous Thromboembolism Prevention Clinical Care Standard

1 **Assess and document VTE risk.**

- **Assess risk – see** VTE Risk; Personal or family history of VTE; VTE risk factors including thrombophilias and medical comorbidities
- **Document in VTE risk assessment section of WA HMC:** On admission
- Antenatal- at booking and repeat if admitted

2 **Develop a VTE prevention plan, balancing the risk of VTE against bleeding.**

- **Assess** Bleeding risk and Contraindications
- **Document in WA HMC**

3 **Inform and partner with patients.**

Inform patient of:

- Risk of VTE
- Side effects of prophylaxis
- Implications for birth
- VTE prevention*, signs/symptoms**, action to take if symptoms develop

4 **Document and communicate the VTE prevention plan.**

- **Document VTE plan.** Prophylaxis (if required) on the WA HMC, Anticoagulation Chart and Progress Notes where appropriate
- For antenatal women, document in hand-held record
- Include in bedside handover between staff

5 **Use appropriate VTE prevention methods.**

- The principles of adequate hydration and encouragement of early ambulation and leg exercises apply to **all** women regardless of risk status.[1]
- GCS are generally recommended for **all** women who are admitted to hospital (including non-surgical patients) unless contraindicated, and are to be signed for on the WA HMC (MR 810.05) by a Medical Officer.
- Consider prescribing LMWH or UFH if there are **one or more risk factors for VTE** (see below). In women having surgery, this should commence post-operatively as per anaesthetic orders.
- UFH and LMWH are generally preferred
- See General Principles, Mechanical + Pharmacological prophylaxis

6 Reassess risk and monitor the patient for VTE-related complications.

- When admitted, intrapartum or early postpartum
- At intervals no longer than 7 days
- If change in clinical condition or goals of care
- When a new medication chart is commenced and
- On discharge- If persisting risk factors at discharge, consider extended pharmacological prophylaxis

7 Transition from hospital and ongoing care.

Patients requiring ongoing VTE prophylaxis –

- Medication prescription may be discussed with a Pharmacist
- Patients (and/or carer if appropriate) are shown how to administer the medication before discharge, including safe disposal of sharps.
- Include any ongoing VTE care in NACS discharge summary to the woman's GP.

***VTE prevention**- encourage adequate hydration, early ambulation and leg exercises

****Signs and symptoms of VTE include:**
DVT: Leg pain; unilateral swelling; tenderness; oedema; colour change of leg
PE: Dyspnoea; pleuritic chest pain; tachycardia; haemoptysis; cyanosis; raised JVP; signs of DVT or right ventricular strain; collapse

Risk assessment

1. Every woman's risk status is to be assessed by a Medical Officer at the Preadmission Clinic or on admission to the hospital.
2. The recommended prophylaxis according to the woman's risk status is to be determined by the Medical Officer. Mechanical prophylaxis will be prescribed on the WA HMC; pharmacological prophylaxis on the Anticoagulation Medication Chart. The Medical Officer must review the contra-indications to both pharmacological and mechanical prophylaxis prior to prescribing prophylaxis.
3. All oncology patients are automatically considered high risk. Completion of the WA HMC (MR 810.05) is still required. These patients should have pharmacological prophylaxis commenced post-operatively and continued until discharge, if not beyond, at the discretion of the treating team.

Risk factors for VTE

Pre-existing	Transient	Obstetric
Previous VTE[2-4] Heritable thrombophilia[2-4] (e.g. antithrombin deficiency, protein S or C deficiency, factor V Leiden, prothrombin gene mutation) Acquired thrombophilia[2-4] (e.g. antiphospholipid syndrome or persistent antiphospholipid antibodies – lupus anticoagulant, anticardiolipin antibodies, β2-glycoprotein 1 antibodies) Family history unprovoked VTE Oestrogen-related VTE in first degree relative[2] Age >35 [2, 3] (obstetric) Cancer / malignancy[2] Parity ≥3[2] Medical comorbidities (heart disease[3, 4], systemic lupus erythematosus[2, 4], inflammatory polyarthropathy[2], inflammatory bowel disease[2], pre-existing diabetes[4], nephrotic syndrome[2], anaemia[2, 4], stroke) Obesity[2-4] (BMI >30 pre / early pregnancy[2]) Oral contraceptive or hormone replacement therapy Sickle cell disease[2, 4] Smoking[2-4]; Current IV drug use[2] Varicose veins[2]	Dehydration / Hyperemesis[2, 4] Fracture[2] Immobility [2-5] (admission to hospital in pregnancy[2], ≥3 days bed rest, paraplegia[2] / lower limb paralysis/ immobilisation- e.g. in plaster case/brace – or prolonged air travel >4 hours[2]) Infection – severe or systemic infection[2] / urinary tract infection[2] Surgery (major >60 minutes or surgery during pregnancy or puerperium[2], except immediate repair of perineum)	**Pregnancy and puerperium** Ovarian hyperstimulation syndrome (first trimester only)[2], assisted reproductive technology[2, 4], in vitro fertilisation[2] Antepartum haemorrhage[2, 4] Fetal growth restriction[4] Multiple pregnancy[3, 4] Pre-eclampsia[3, 4], pregnancy induced hypertension[2] Weight gain in pregnancy >21kg[2, 4] Caesarean birth, particularly emergency Caesarean [2-4] Mid-cavity or rotational operative birth[2] Preterm birth <37 weeks[2] Prolonged labour >24 hours[2, 3] Stillbirth[2] Postpartum haemorrhage >1000mL[2, 4] Blood transfusion[2, 4]

Risk factors for bleeding

- Bleeding history
  - Current active major bleeding[2] (defined as requiring at least 2 units of blood or blood products to be transfused in 24 hours)
  - Current clinically significant and measurable bleeding over 48 hours
  - Family history of bleeding or personal history of bleeding disorders[1]; such as haemophilia, von Willebrand disease
  - Acquired coagulopathy (e.g. disseminated intravascular coagulation)
- Recent (<4 weeks) haemorrhagic[1] or ischaemic stroke
- Intracranial or spinal lesion
- Severe platelet dysfunction or thrombocytopenia[1]
- Active peptic ulcer or active ulcerative gastrointestinal disease[1]
- Abnormal renal function or liver disease[1]
  - Severe liver disease, obstructive jaundice or cholestasis
  - Severe renal impairment (especially eGFR <30mL/minute/1.73m^2)
- Concomitant use of medication that may affect the clotting process. That is, medications that directly increase bleeding risk, or alter metabolism / interact with agents used to prevent VTE[1] (e.g. anticoagulants, antiplatelet drugs, non-steroidal anti-inflammatory drugs or thrombolytic agents). See also ACSQHC VTE Clinical Care Standard 'Appendix 1: Medicines that Affect Bleeding Risk'
- Recent major surgical procedure with a high bleeding risk; procedures with potentially critical consequences of bleeding e.g. neuraxial anaesthesia or recent lumbar puncture[1]
- High risk of falls
- Uncontrolled hypertension[1] with SBP >200mmHg or DBP >120mmHg

Potential contraindications to LMWH or heparin

Discuss the balance of risk / benefit with a Haematologist.

- Adverse reaction/ allergy to enoxaparin, heparin or its derivatives[5]
- Acute bacterial endocarditis[5]
- Conditions with a high risk of haemorrhage[5] (including active ante/post-partum haemorrhage, placental abnormalities (e.g. praevia, accreta), haemorrhagic or ischaemic stroke within 4 weeks)
- Active or past history (within past 100 days) of immune mediated heparin-induced thrombocytopenia (HIT) or presence of circulating antibodies[5]

Mechanical and non-pharmacological prophylaxis

- All women require early ambulation post-surgery and adequate hydration.[1]
- Graduated compression stockings (GCS) are recommended for **all** women until fully mobile, unless contraindicated. This includes all post-operative gynaecological patients; all obstetric women who should have GCS fitted pre-operatively or on antenatal admission unless contra-indicated.
- GCS must be prescribed three times daily on the WA HMC. Nursing / midwifery staff will be prompted to check for compliance, correct size and fit of stockings.
- Intermittent pneumatic calf compression (IPCC) should be considered instead of GCS in women who would normally receive LMWH or UFH but who are unable to receive it (e.g. bleeding risk), in women who will be immobile for extended periods post-operatively and in women who are unable to wear GCS and have additional risk factors (e.g. obesity, immobility).

For information on GCS and intermittent pneumatic compression (IPC), see SCGH-OPH Guideline No 30: Venous Thromboembolism Prophylaxis (available to WA Health employees through Healthpoint).

KEMH specific information:

- Document on the WA HMC: MR 810.05

Pharmacological prophylaxis

1. Assess VTE risk and consider risk factors for bleeding. Document:
   - On the Anticoagulation Medication Chart (MR 810.11):
     - All anticoagulants are prescribed on the Anticoagulation Medication Chart
   - On the Operation Record (MR 315)
     - Post-operative thromboprophylaxis management should be outlined in the post-operative instructions on the Operation Record (MR315) by the Surgeon
   - In the Progress Notes (MR 250)
     - If the VTE prophylaxis differs from the recommendations, then the reason must be documented in the patient's medical record
2. The decision whether to prescribe prophylactic LMWH **OR** unfractionated heparin (UFH) will depend on the Medical Practitioner / Surgeon's assessment of the woman's individual risk for haemorrhage.

LMWH prophylactic doses

The standard dose of enoxaparin is 40mg daily. At extremes of weight (<50 or >100kg) consult Haematologist. Weight-adjusted prophylaxis may be warranted and, depending on circumstances, monitoring with anti-Xa activity may be warranted.

Bridging doses

Guidelines for pharmacological prophylaxis for women who birth or have surgery outside normal daytime hours

The administration time of LMWH is fixed at 20:00. As such, women who birth or have surgery after 16:00 or prior to 08:00 may have a considerable delay prior to their first dose of LMWH. Subcutaneous (subcut) UFH should be considered as a bridging method until their first dose of LMWH. Women who birth or have surgery between 16:00 and 24:00 will require two bridging doses of heparin whilst women who birth or have surgery after 24:00 will only require one.

1. Unless contra-indicated, women who birth or have surgery between 16:00 and 24:00 will be administered UFH 5000 units subcut, at 4 and 12 hours post-birth/surgical completion.
2. Unless contra-indicated, women who birth or have surgery between 24:00 and 08:00 will be administered UFH, 5000 units subcut, 4 hours post-birth / surgical completion.

Additional information for non-obstetric patients

These recommendations are **NOT** intended for women admitted as day surgery cases. The risk of developing VTE when undergoing day surgery or minor surgery is considered to be generally low. However if the operative procedure is prolonged or the woman is at significant risk, then VTE prophylaxis is recommended.

Major surgery with inpatient stay or woman at increased VTE risk

- If used, heparin 5000 units subcut three times daily is recommended unless there is a clinical indication to prescribe it twice daily (e.g. patients with a weight <50kg). The rationale for the decision to prescribe twice daily heparin must be documented in the medical record.
- If clinically appropriate, pharmacological prophylaxis may be changed to enoxaparin once daily from day 2 post-operatively or when surgically safe.
- Enoxaparin is generally commenced when the next dose of heparin would be due. For example, if unfractionated heparin is prescribed at 08:00, 12:00 and 20:00 then day 2 heparin should be administered at 08:00 and 12:00; enoxaparin should be given at 20:00.

Surgical gynaecology patients:

- Thromboprophylaxis following gynaecology surgery should be maintained for 7-10 days[6] or until fully mobile.

Surgical oncology patients:

- Consider using extended prophylaxis with LMWH for up to 28 days after major abdominal or pelvic oncology surgery where high-risk VTE features[6] (e.g. in patients who are obese, slow to mobilise, have a known thrombophilia (e.g. Protein S Deficiency, Factor V Leiden) or have a past history of VTE).
    - Patients considered at high risk may be discharged home on prophylactic enoxaparin once daily for extended prophylaxis. Patients should be taught to self-administer enoxaparin prior to discharge.

Gynaecology / oncology patients:

- Gynaecology patients typically receive LMWH prophylaxis as first line; oncology patients (particularly if undergoing major surgery) will generally receive unfractionated heparin before LMWH.

Additional information for obstetric patients

In pregnancy and the postpartum period, VTE is uncommon (1-2 per 1000) but clinically important,[2, 7] being the most common cause of direct maternal mortality in Australia,[8] and one of the leading causes worldwide[9]. The risk of VTE is increased 4-6 fold in pregnancy, and further increased postpartum.[2] Previous VTE is one of the most significant risk factors (odds ratio 24.8) for pregnancy associated VTE,[2, 7] with recurrence rates in pregnancy / postpartum between 2-11% (relative risk 3.5).[2] The risk is higher after unprovoked (no identified risk factors) than provoked thrombosis.[7] Heritable thrombophilia may be identified in 20-50% of pregnancy-associated VTE.[2]

Key points

1. Personal history of VTE, family history of VTE and the presence of inherited thrombophilia are key considerations in the risk stratification of pregnant patients.
2. Every patient with a history of VTE should be discussed with an Obstetric Physician or Haematologist and have a management plan for thromboprophylaxis during pregnancy and post-partum.
3. Women with a history of VTE and a negative thrombophilia screen do not require further thrombophilia testing.
4. Family history of a VTE increases an individual's risk of VTE by 2-4 times, regardless of thrombophilia status.
5. Routine screening for thrombophilia in pregnant women is not recommended. If there is concern (e.g. family history or personal history of an unprovoked VTE), consult Haematologist.
6. LMWH is the drug of choice for treatment and prevention of VTE in pregnancy
7. Anti-Xa levels are not routinely recommended for monitoring. Exceptions (e.g. antithrombin deficiency, extremes of body weight, renal failure or bleeding/recurrent VTE on treatment) exist- discuss with a Haematologist.
8. Post-partum prophylaxis is generally continued for 6 weeks post-partum.

Personal history of VTE

1. Pre-conception counselling for women on long term warfarin or direct oral anticoagulants (DOAC) is recommended given the proven/potential risks of these medications to the fetus. These agents should be changed to therapeutic doses of LMWH as soon as pregnancy is confirmed, ideally within 2 weeks of the missed period.[2]
2. Women with a past history of VTE necessitating indefinite / life-long anticoagulation therapy should generally remain on therapeutic anticoagulation for the duration of pregnancy. Special cases (antithrombin deficiency, antiphospholipid syndrome) are discussed below.

3. Women with a history of VTE and who are not on long-term anticoagulation should receive post-partum prophylaxis.
4. Women with unprovoked or oestrogen-associated VTE **NOT** on indefinite anticoagulation should generally receive antepartum and post-partum prophylaxis with a LMWH. Starting gestation depends on individual risk assessment.
5. Women with a history of provoked VTE relating to a major transient risk factor (e.g. major surgery) without thrombophilia generally do not require antepartum prophylaxis. Post-partum prophylaxis with LMWH is recommended.
6. Women with a provoked VTE and thrombophilia need to be assessed individually. Refer to Haematologist.

Antithrombin deficiency

1. Antithrombin deficiency with a family history of VTE requires Haematologist / Obstetric Physician management. Early review is essential given antithrombin deficiency carries the greatest VTE risk of the inherited thrombophilias.
2. Antithrombin levels fall ~20% during pregnancy. There is an additional and precipitous fall of ≥30% immediately following delivery before a gradual recovery to baseline over the next 72+ hours.
3. Low antithrombin levels may confer resistance to unfractionated heparin.
4. Antithrombin concentrate,may be required at the onset of labour or prior to caesarean birth.[2] Post-partum administration may also be required given the post-partum fall in antithrombin levels. Discuss with Haematologist.

Antiphospholipid syndrome (APS)

1. Women with antiphospholipid syndrome are at high risk of complications – including recurrent thrombosis and bleeding – during pregnancy. These women should be managed by an expert Obstetric service with regular review by a Haematologist / Physician.
2. Many women with APS are on oral anticoagulation pre-pregnancy and will require therapeutic anticoagulation with LMWH for the duration of pregnancy and until return to oral anticoagulation.[2]
3. Persistent antiphospholipid antibodies (lupus anticoagulant, anticardiolipin or β_2-glycoprotein 1 antibodies) in women **NOT** meeting clinical criteria (VTE, arterial thrombosis or recurrent pregnancy loss) represent a challenging, scenario. Antenatal and postnatal thromboprophylaxis may be appropriate – Haematologist / Physician input is warranted.

Heritable thrombophilia without personal history

1. The presence / absence of a family history of VTE (and the surrounding circumstances) are important for the risk stratification of women with demonstrated thrombophilia who do not have a personal history of VTE.
2. Individual risks should be evaluated based on the thrombophilia and presence of other clinical risk factors.[2]
3. The recommendations below are based on expert opinion. Treatment should be individualised based on the estimated risk of VTE and the risk of bleeding with pharmacological thromboprophylaxis. If there is uncertainty, consult an Haematologist / Physician.

Heritable thrombophilias with no family history of VTE

Thrombophilia		Antepartum prophylaxis	Post-partum prophylaxis
Factor V Leiden	Heterozygous	No	No*
	Homozygous	Yes	Yes
Prothrombin gene mutation	Heterozygous	No	No*
	Homozygous	Yes	Yes
Compound heterozygote for FVL and PGM		Yes	Yes
Protein C deficiency		No	No*
Protein S deficiency		No	No*

*Consider if additional risk factors

Heritable thrombophilia with family history of VTE

Thrombophilia		Antepartum prophylaxis	Post-partum prophylaxis
Factor V Leiden	Heterozygous	No	No*
	Homozygous	Yes	Yes
Prothrombin gene mutation	Heterozygous	No	No*
	Homozygous	Yes	Yes
Compound heterozygote for FVL and PGM		Yes	Yes
Protein C deficiency		No*	Yes
Protein S deficiency		No*	Yes

*Consider if additional risk factors

Intrapartum / birth

1. Plan birth where possible. Liaise with the multidisciplinary team regarding timing of LMWH cessation and commencement of post-partum prophylaxis. Document the plan of care.
2. All women should be advised to cease LMWH if they have vaginal bleeding or if labour commences.
3. If receiving antepartum LMWH:
    - If considered to be at high risk of recurrent VTE, consider elective admission and transition to intravenous (IV) unfractionated heparin in advance of birth
    - If considered to be lower risk, stop LMWH 24 hours prior to planned birth / procedure.[10]
4. Neuraxial anaesthesia
    - Neuraxial anaesthesia should be avoided until ≥12 hours after the last dose of prophylactic LMWH or ≥24 hours after the last therapeutic dose.
    - Epidural catheters should be removed ≥12 hours after last dose of LMWH.[2]
    - LMWH should not be given within 4 hours after use of spinal anaesthesia or after removal of an epidural catheter.[2]
    - See also Anaesthetics and Pain Medicine guideline: Labour and Post-operative Analgesia (section: Epidural Catheter Removal: Management of LMWH, UFH and Neuraxial Blockade) for more details
5. After the birth, restart LMWH or heparin as soon as risk of bleeding is acceptable. This is usually at least 4 hours after the birth or following removal of epidural catheter – check with Obstetrician.[2] In women who are therapeutically anticoagulated outside pregnancy, a short (e.g. 24-48 hour) period of prophylaxis should be considered, especially if at high risk of bleeding.
6. LMWH and warfarin are compatible with breastfeeding.[2] Safety data on the use of DOACs in breastfeeding is limited and these agents should NOT be used.

Prophylaxis: In women with cardiac conditions

See KEMH Clinical Guideline, Obstetrics & Gynaecology: Cardiac Disease: VTE: Cardiac Conditions (in pregnancy & puerperium)

Prophylaxis: After vaginal birth

1. Perform risk assessment for VTE and document appropriately. Consider the woman's risk factors for VTE and her risk of bleeding.
2. Early ambulation and mechanical thromboprophylaxis are recommended unless contra-indicated (see General principles).
3. For high risk patients (e.g. inherited thrombophilia, anticoagulation or pharmacological thromboprophylaxis during pregnancy) refer to management in relevant sections of this guideline: 'Pharmacological prophylaxis: Additional information for obstetric patients'.

Prophylaxis: After caesarean birth

Quick Reference Guide

Consider risk factors for postpartum VTE and risk of bleeding

Review risk factors intrapartum or early postpartum, if clinical condition changes, and again before discharge. If persisting risk factors at discharge, consider extended prophylaxis.

Non-pharmacological thromboprophylaxis:

ALL women after Caesarean section (CS) birth:

- Early mobilisation
- Adequate hydration
- GCS stockings, unless contraindicated, until fully mobile
- Educate on VTE prevention, signs & symptoms, and action to take if symptoms develop
- Consider IPCC device intra/postoperatively if cannot wear GCS and/or receive pharmacological thromboprophylaxis

Pharmacological thromboprophylaxis:

Lower risk:

- Elective CS with **NO other risk factors:**
  - **No** thromboprophylaxis with LMWH

Intermediate risk (assess bleeding risk & contraindications prior):

- **Elective CS** with **one or more** risk factors (in addition to puerperium) **OR**
- **Emergency / non-elective CS in labour**

Consider 10 days postnatal prophylactic LMWH (enoxaparin subcut once daily at 2000hrs*). See LMWH Prophylactic doses for weight considerations.

- *Bridging doses for births outside daylight hours:
  - If CS between 1600-2400hrs: replace day 1 LMWH dose with 5000 units UFH subcut at 4 & 12hrs after CS
  - If CS between 2400-0800hrs: give 5000 units UFH subcut 4hrs after CS

If additional risk factors persisting (lasting more than 10 days postpartum e.g. prolonged admission, wound infection), consider extending postnatal LMWH for up to six weeks[2]

High risk (Previous VTE or requiring antenatal LMWH):

- At least 6 weeks postnatal prophylactic LMWH

See also sections in this document: Pharmacological prophylaxis: Additional information for obstetric patients' for discussion of specific scenarios (e.g. history of VTE, heritable thrombophilia etc.)

Note: This QRG represents minimum care and should be read in conjunction with the full guideline. Additional care should be individualised.

Key points

1. Perform risk assessment for VTE and document appropriately. Consider the woman's risk factors for VTE and her risk of bleeding.
2. Early ambulation, adequate hydration and mechanical thromboprophylaxis are recommended unless contra-indicated (see point 5 within General principles). There is limited literature on the effect of mechanical methods for postpartum thromboprophylaxis, however benefit has been shown in other clinical areas.[11, 12] Unless contra-indicated, consider IPCC devices for the intra and post-operative periods in women with very high VTE risk, or who are unable to wear GCS and / or are unable to receive pharmacological prophylaxis.
3. In women with risk factors a combination of pharmacological and non-pharmacological methods is recommended.[11]
4. When used after caesarean birth, LMWH may increase the frequency of bleeding and wound haematoma.[2] Pharmacological prophylaxis may be contraindicated in women with primary postpartum haemorrhage >1000mL, although these women are at increased risk of VTE.[2] The decision to utilise pharmacological thromboprophylaxis in these women should be at the discretion of the Obstetrician and Anaesthetist.
5. Review risk factors intrapartum or early postpartum, if clinical condition changes, and again before discharge. If risk factors persist at discharge, consider extended pharmacological prophylaxis.

Pharmacological thromboprophylaxis

1. Women having an Elective Caesarean with no other risk factors for VTE (other than puerperium) do NOT require post-operative thromboprophylaxis with LMWH.[2]
2. For women with additional VTE risk factors, including women who had an emergency Caesarean in labour, consider:
   - Enoxaparin subcut[13], prescribed at 20:00 post-operatively unless contra-indicated. Consider 10 days prophylaxis[2], or at least until discharge from hospital.[13] See LMWH prophylactic doses.
   - The duration of pharmacological prophylaxis depends on level of VTE risk. Reassess for persisting risk factors prior to discharge.
3. In women receiving neuraxial anaesthesia, see 'Additional Information for Obstetric Patients: Intrapartum / Birth' for information on timing of the first dose of pharmacological prophylaxis and removal of the epidural catheter. .
4. In obese patients with a BMI ≥40, and/or women with intermediate risk (two or more persisting risk factors), consider prophylactic LMWH in doses appropriate for their weight for 10 days postpartum.[2]
5. For high risk patients (e.g. inherited thrombophilia, anticoagulation pharmacological prophylaxis during pregnancy) refer to management in relevant sections of this guideline: 'Pharmacological prophylaxis: Additional information for obstetric patients'

Therapeutic anticoagulation

Intravenous heparin

Key points

1. IV heparin administration is to be supervised by a Haematologist / Physician.
2. IV heparin is prescribed on the Anticoagulation Medication Chart MR 810.11.
3. The target APTT range, initial bolus (if required) and starting infusion rate are to be advised by Haematologist / Physician.
4. The APTT is to be measured within 6 hours of commencing IV heparin or as advised by Haematologist / Physician.
5. The Haematologist / Physician are to be contacted with the APTT result and will advise on infusion rate and timing of further APTT assay.
6. See Pharmacy Adult Medication Monograph: Heparin and see section 'Recommendations for Intravenous Unfractionated Heparin' within the 'Anticoagulation Medication Chart'.

Low molecular weight heparin

Key points

1. LMWHs are the preferred anticoagulant for the majority of pregnant women.
2. LMWHs are prescribed on the Anticoagulation Medication Chart MR 810.11.
3. Twice-daily administration based on the booking or early pregnancy weight is preferred.
4. Routine therapeutic monitoring via anti-Xa assays is not recommended but may be considered in specific patient scenarios.
5. Enoxaparin (Clexane®) is the preferred initial LMWH at KEMH. Alternative products may be appropriate depending on clinical circumstances.

Advantages

Systematic reviews and large case series have concluded LMWHs are a safe and effective alternative to UFH for treatment of VTE in pregnancy.[10] A LMWH is thus the treatment of choice.[4, 9] Advantages of LMWH therapy include:

- Longer plasma half-life, higher bioavailability, more predictable anticoagulant effect and less painful subcutaneous injections due to smaller injection volume when compared to UFH.[9, 14]

- Comparable rates of postpartum haemorrhage (approximately 5%) in women receiving LMWH[9] vs. no anticoagulant
- Significantly lower risk of HIT and osteoporosis with LWMH vs. UFH.[2, 4, 10, 14]
- Lack of placental transfer[4, 9, 10, 14]

Dosing LMWH- Therapeutic

The dose of LMWH should be based on the patient's booking or early pregnancy weight.[10] There is insufficient evidence to favour either once daily or two divided doses.[9, 10] Based on expert recommendations, pregnant women with DVT or PE should be treated with **twice daily LMWH**, but once daily dosing can be considered in the postpartum period. Doses of enoxaparin are outlined below.[10]

Booking/early pregnancy weight	**Therapeutic** enoxaparin dose*	
	Twice daily dosing	Once daily dose
<50kg	40mg b.d.	60mg once daily
50-69kg	60mg b.d.	90mg once daily
70-89kg	80mg b.d.	120mg once daily
90-109kg	100mg b.d.	150mg once daily
110-125kg	120mg b.d.	180mg once daily
>125kg	Discuss with haematologist	

*Doses should be reduced if the creatinine clearance is<30mL/minute.

There is insufficient evidence to recommend routine monitoring of anti-Xa levels to guide LMWH dosing in pregnancy.[4, 9] Anti-Xa monitoring may be considered in patients at extremes of body weight (<50kg or >90kg), with renal impairment or in recurrent VTE[4] despite anticoagulation – discuss with Haematologist. The platelet count does not need monitoring in LMWH treatment given the low risk of HIT.[4, 10]

Warfarin: Initiation

Key points

1. If warfarin therapy is to be initiated (e.g. following VTE), discuss the target INR / duration of therapy with a Haematologist / Physician.
2. As warfarin takes several days to achieve therapeutic effect, co-administration of a rapidly acting agent (e.g. LMWH) is generally required.
3. Warfarin is generally initiated at 5mg daily. Lower doses may be appropriate in some clinical scenarios (e.g. malnutrition, abnormal INR at initiation). "Loading" doses (e.g. 10mg for 2-3 days) are not recommended.
4. Check the INR on day 3. Modify the day 3 dose based on this result – refer to table below ("Initiation dosing for warfarin with target INR 2-3").
5. Ongoing adjustment of warfarin dose is INR-dependent; consider daily monitoring in acutely ill patients or those with frequent medication changes.

Initiation dosing for warfarin with target INR 2-3

Day	INR	Suggested dose
1	1.0-1.4	5 mg
2	No INR	5 mg
3	<1.8 ≥1.8	5 mg 1 mg
4&5	<1.5 1.5-1.9 2.0-2.5 2.6-3.5 3.6-4.0 4.1-4.5 >4.5	7 mg 5mg 4mg 3mg 2mg 1mg See treatment reversal
6 onwards	Measure on alternate days until stable (daily if drug interaction or high bleeding risk)	As for days 4&5 or per clinical judgement

Warfarin: Peri-operative management

Key points

1. If urgent surgery is required for a woman on warfarin, rapid reversal of warfarin may be required. Discuss with a Haematologist.
2. If elective surgery is planned and warfarin is to be ceased for the surgery, a perioperative anticoagulation plan is required.
3. Advice should be sought from the Haematologist / Physician about when the woman is to stop her warfarin, when her INR is to be checked and whether bridging anticoagulation with LMWH is required.
4. If bridging anticoagulation is required, the dosing schedule and the timing of the last dose pre-operatively need to be advised and documented.
5. A post-operative plan for restarting warfarin +/- LMWH is needed.

6. Acutely ill patients, where warfarin is continued, generally require daily monitoring of the INR given changes in vitamin K metabolism.

Recommencing warfarin after surgery

1. The timing of warfarin recommencement post-operatively should be guided by the Haematologist / Physician in conjunction with the surgical team.
2. Administer the same warfarin brand (e.g. Coumadin, Marevan) that the woman was previously using. Brands are not interchangeable.
3. Warfarin should be recommenced at the same dose prescribed prior to interruption. Check the INR on day 3.
4. Modify dosing for day 3 based on the day 3 INR. Seek Haematologist / Physician advice as needed, especially if INR remains sub- or supra-therapeutic despite dose modification.

Anticoagulant reversal

Discussion with the Haematologist is advised in cases where rapid reversal of anticoagulant therapy is being considered. Unfractionated heparin and warfarin are rapidly reversible with treatment. LMWH and DOACs are less reversible.

Refer to Anticoagulation Medication Chart MR 810.11

http://ww2.health.wa.gov.au/~/media/Files/Corporate/general%20documents/Quality/PDF/Anticoagulation-Medication-Chart-Template.ashx

Intrapartum management

A multidisciplinary team including Obstetric Physicians and/or Haematologists, Obstetricians and Anaesthetists should be involved in the intrapartum management of women receiving therapeutic anticoagualtion in order to minimise the risks of VTE recurrence / progression and of maternal haemorrhage / epidural haematoma[4]. Where possible, anticoagulation should be interrupted prior to birth to avoid bleeding complications.[10] Decisions regarding timing of anticoagulant cessation and anticoagulant bridging must be individualised, taking into account size and recency of VTE and presence of risk factors for recurrence. Generally:

- Women should be informed not to administer anticoagulation if they have vaginal bleeding or begin spontaneous labour.[2, 4, 10]
- Therapeutic LMWH should be stopped 24 hours prior to induction of labour or Caesarean section and replaced with prophylactic LMWH to be given 12 hours prior to induction or Caesarean section.[10]
- Intravenous UFH should be stopped 6 hours before induction of labour or Caesarean section. The APTT should be measured 4 hours after cessation (i.e. 2 hours prior to induction/Caesarean) to ensure normalisation.[4, 10]
- If labour occurs whilst the woman is anticoagulated blood should be sent for cross-matching. Consult the Anaesthetist and a Haematologist or Obstetric Physician regarding reversal options.

When VTE occurs near term, treatment with IV UFH may be utilised to minimise the duration without anticoagulation and allow timely cessation for delivery.[4, 10] Women with a very high risk of VTE recurrence may also be transitioned to intravenous UFH prior to birth.[9] In these cases, planned birth through induction or labour or elective Caesarean section is recommended.[9]

Neuraxial anaesthesia

Epidural haematoma is a rare, though devastating, complication of neuraxial anaesthesia. The risk of this is increased by recent anticoagulant administration.

- Neuraxial anaesthesia should be avoided until ≥24 hours after therapeutic LMWH.[4, 10]
- Epidural catheters should be removed ≥12 hours after last dose of LMWH.[10]
- Therapeutic anticoagulation should not be resumed until ≥ 24 hours after removal of an epidural catheter.[4]

Discuss dose / timing of anticoagulant therapy with the Anaesthetist. See also Anaesthetic guideline: Labour and Postoperative Pain Management for section on ‘Epidural Catheter Removal: Management of LMWH, UFH and Neuraxial Blockade’ (available to WA Health employees through Healthpoint).

Caesarean section

In the case of Caesarean section, a prophylactic dose of LMWH should be given 4 hours post-operatively, and the therapeutic dose recommenced 8-12 hours later.[4, 10]

Postnatal management

The choice of post-partum anticoagulant management depends on individual preferences and, in particular, decisions around breastfeeding. In women wishing to breastfeed, ongoing LMWH therapy and warfarin are the safest options. DOACs are additional choices if not breastfeeding.

Initiation of warfarin should be delayed until at least postnatal day 5.[4, 10] UFH / LMWH therapy should continue until the INR is therapeutic (generally >2) for at least 24 hours.[10] The INR must be monitored regularly in women receiving warfarin with the dose titrated to achieve the target INR (generally 2–3).[10]

Women with VTE in pregnancy should be reviewed in an obstetric medicine clinic postnatally for discussion of thromboprophylaxis in future pregnancies (and other times of heightened risk) and options around hormonal contraception.[10] Thrombophilia testing may also be considered if anticoagulation has been ceased and this testing will influence subsequent management. Prior to undergoing investigation for heritable or acquired thrombophilia women should be counselled on the implications of the result for themselves and their family.[2]

Newly diagnosed VTE

Quick Reference Guide

Presents with symptoms / signs of VTE

- **DVT:** Leg pain, unilateral swelling, tenderness, oedema, colour change of leg
- **PE:** Dyspnoea, pleuritic chest pain, tachycardia, haemoptysis, cyanosis, raised JVP, signs of DVT or right ventricular strain, collapse

Assess risk factors for VTE

Diagnose / exclude

- **DVT:** Compression ultrasound
- **PE:** ECG & CXR, V/Q scan if CXR normal, CTPA if CXR abnormal

Treat

- Consult with Haematologist / Physician
- Take full blood count, coagulation screen, U&Es, LFTs to confirm normal prior to treatment
- **Confirmed PE or proximal (above knee) DVT:** Therapeutic anticoagulation for a minimum treatment period of three months or until 6 weeks postpartum, whichever occurs later
- **Confirmed distal DVT (below knee):** Therapeutic anticoagulation for at least 6 weeks with reassessment at that point. Consider ongoing prophylaxis if ongoing risk factors (including pregnancy and 6 week post-partum period)
- **Therapeutic anticoagulation:** Refer to Therapeutic Anticoagulation
- **Prophylactic anticoagulation:** Refer to LMWH Prophylactic Doses

Birth (obstetric patients)

- Planned birth (induction, Caesarean) preferred. Discontinue anticoagulant 24 hours prior
- If spontaneous labour, send blood for cross match and consult Haematologist / Physician and Anaesthetist

Note: This QRG represents minimum care & should be read in conjunction with the full guideline. Additional care should be individualised.

Aim

To guide the appropriate investigation of women with suspected VTE and management of confirmed VTE.

Key points

1. VTE is an important cause of morbidity and mortality in pregnant women
2. Important risk factors include history of VTE, malignant history, thrombophilia, age, obesity and, in obstetric patients, Caesarean section
3. Women with suspected VTE in pregnancy should be commenced on therapeutic LMWH and undergo prompt investigation for VTE
4. The diagnostic investigation of choice for DVT is compression ultrasound
5. The diagnostic investigation of choice for PE is V/Q scan
6. The risk of radiation to the fetus from chest X-ray, V/Q scan and CTPA is minimal
7. **Confirmed PE or proximal (above knee) DVT:** Is treated with therapeutic anticoagulation for a minimum period of three months, or until 6 weeks postpartum, whichever occurs later.
8. **Confirmed distal DVT (below knee):** Is generally treated for at least 6 weeks before prophylactic anticoagulation for the remainder of pregnancy and 6 weeks postpartum. Longer courses of therapeutic dose anticoagulation may be appropriate if there is residual thrombus on follow-up imaging or persistent risk factors.
9. LMWH is generally the anticoagulant of choice in pregnancy
10. Warfarin may be considered in the postpartum period.
11. DOACs are contraindicated during pregnancy and breastfeeding.
12. Intravenous UFH allows rapid onset and titration of anticoagulant effect and is preferred in the management of massive PE and VTE at term / intrapartum
13. GCS may reduce pain and swelling; they have not been shown to reduce the risk of post-thrombotic syndrome
14. Women with VTE in pregnancy should have postnatal follow up in an obstetric medicine clinic to plan for anticoagulation in future pregnancies (and other high risk situations) and consider thrombophilia testing

Background

Pregnancy and the puerperium

Thromboembolism is the leading cause of direct maternal deaths during pregnancy in Australia.[8] It may also result in long-term morbidity through venous insufficiency and post-thrombotic syndrome.[3, 9, 15] DVTs account for approximately 80% of thromboembolic events in pregnancy.[15]

Physiological changes occurring in pregnancy from the first trimester, including a shift towards a hypercoagulable state, venous stasis, compression of the inferior vena cava and pelvic veins by the gravid uterus and reduced mobility, increase the risk of VTE during pregnancy by 4-5 times that of non-pregnant women of the same age.[2-4, 10, 15] The risk increases with gestational age and the maximal risk occurs during the first six weeks postpartum, with a 22-fold increase in relative risk.[2-4, 14] Delivery via elective Caesarean section further increases the risk of VTE (approximately 2-fold over vaginal delivery) while emergency Caesarean section is associated with a four-fold higher risk of postpartum VTE compared to vaginal birth.[2]

Risk factors

See section: Risk factors for VTE

Symptoms and signs

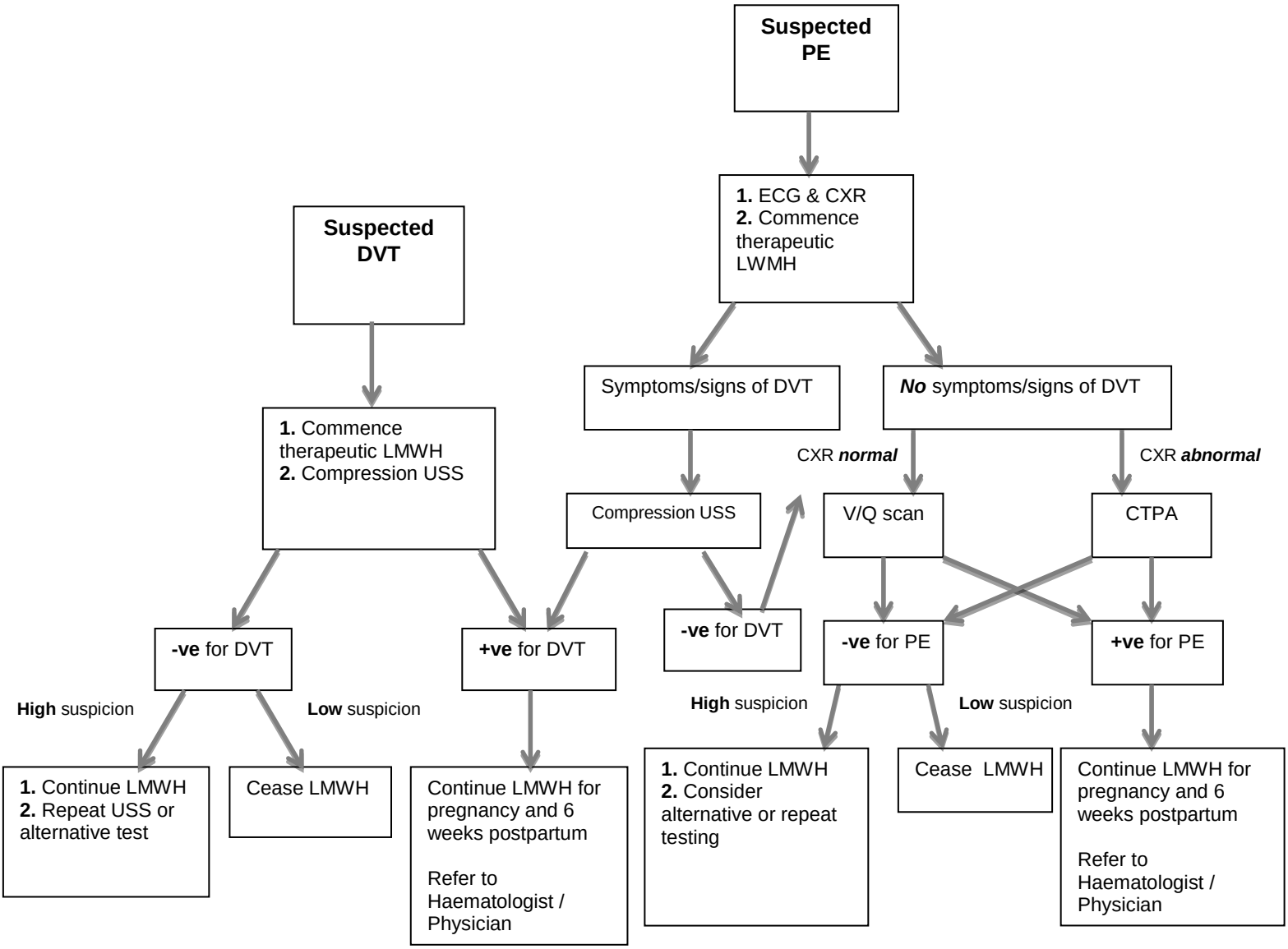
Most, though not all, women who have VTE in pregnancy will manifest clinical symptoms and signs.[10] The symptoms and signs of DVT include (usually unilateral) leg pain / swelling or, in the event of iliofemoral vein thrombosis, lower abdominal or back pain.[3, 10] Calf vein and iliofemoral thrombosis are equally common in pregnancy, with the left leg affected in 80% of cases. Rarely, DVT involves arm veins, particularly after insertion of long intravenous (e.g. PICC) lines.

The symptoms and signs of PE include dyspnoea, tachypnoea, tachycardia, pleuritic chest pain, haemoptysis, cyanosis, raised JVP and collapse.[3, 9, 10] Women with VTE may also have a low-grade fever.[10]

Initial management

Given that the typical symptoms are non-specific, with leg swelling/discomfort and dyspnoea/tachypnoea common in normal pregnancy,[9, 10] timely investigation is mandated. Left untreated DVT will progress to PE in 15-24% of pregnant patients.[10] PE has a mortality rate of 15% in pregnancy, with 66% of deaths occurring in the first 30 minutes of the embolic event.[10] Decisions regarding initiation of therapeutic anticoagulation depend on clinical presentation and access to diagnostic imaging. Generally, anticoagulation should be commenced in haemodynamically unstable women or if imaging is not immediately available.

Evaluation of suspected VTE in pregnancy



Investigation

Investigation for DVT

First line investigation for DVT in pregnancy is compression ultrasound of the whole leg, looking for both proximal and distal DVT.[9, 10] If the ultrasound in negative and the clinical suspicion for DVT is low, anticoagulation may be ceased.[10] If the ultrasound is negative but the clinical suspicion for DVT remains high– particularly if iliofemoral DVT is suspected –, further investigation with repeat compression ultrasound, venography or magnetic resonance imaging should be considered.[9]

Investigation for PE

All women with suspected PE should have an ECG and chest X-ray.[10] 41% of pregnant women with PE have an abnormal ECG.[10] The most common ECG changes include tachycardia, T wave inversion, S1Q3T3 pattern and right bundle branch block.[10] Chest X-ray is useful in detecting differential diagnoses for the woman's symptoms, and may also show abnormalities caused by PE including atelectasis, effusion, focal opacities, regional oligaemia or pulmonary oedema.[10] The radiation dose to the fetus from a chest X-ray is extremely low at any stage of pregnancy.[10] A negative chest X-ray does not exclude PE,

Women with suspected PE who also have symptoms and signs of DVT should have a compression Duplex ultrasound prior to undergoing further investigation for PE.[10] If DVT is confirmed on compression ultrasound no further investigation is required and they should continue therapeutic anticoagulation.[10] This limits the dose of radiation to the woman and the fetus.[10]

Women with suspected PE without symptoms or signs of DVT should have a ventilation/perfusion (V/Q) scan or computed tomography pulmonary angiogram (CTPA).[10] In non-pregnant patients, there is a high rate of non-diagnostic V/Q scan and CTPA is now the investigation of choice for PE.[9] However, the increased cardiac output in pregnancy reduces the rate of non-diagnostic V/Q scan and thus V/Q scan is generally the first-line investigation for PE in pregnancy.[9] If the chest X-ray is normal, proceed to V/Q scan. If the chest X-ray is abnormal (or if there is clinical instability) CTPA is preferred.[10] If the V/Q scan or CTPA is negative, but the clinical suspicion of PE remains high, therapeutic anticoagulation should be continued until PE is excluded on alternative or repeat testing.[10]

Both CTPA and V/Q scan expose the fetus to a negligible radiation dose of (0.1mGy and 0.5mGy respectively). These are below the threshold for teratogenicity, fetal growth restriction and fetal death, and the potential harm resulting from a missed PE

is significantly greater than the risk of radiation.[9, 10] The higher radiation dose from V/Q scan is associated with a very small increase in risk of childhood cancer.[10] The radiation dose to maternal breast tissue from CTPA is 20-100 times that from V/Q scan depending on breast size, the technique used and the age of the woman. This increases the woman's lifetime risk of breast cancer.[9, 10] In younger women, particularly women who have had a previous chest CT or have a family history of breast cancer, V/Q scan should be the investigation of choice.[10] Where CTPA is required due to unavailability of V/Q scan, abnormal chest X-ray, or negative V/Q scan in the context of ongoing high clinical suspicion for PE, a bismuth shield in front of the woman's breasts should be used to reduce the radiation dose to breast tissue.[9, 10] To minimise the radiation dose to the fetus from V/Q scan, the ventilation component of the scan can be omitted, without compromising the negative predictive value of the scan.[9, 10] A positive perfusion scan requires a ventilation study to assess for ventilation/perfusion mismatch.[9] Breastfeeding women should discard breast milk for 12 hours after a V/Q scan; this is not required following CTPA.[9]

There is a theoretical risk of neonatal hypothyroidism from fetal exposure to the iodinated contrast used in CTPA, though this has not been observed in studies to date.[10] Pregnant women with suspected PE should be informed of the above risks prior to undergoing V/Q scan or CTPA and should provide informed consent before the investigation is undertaken.[10]

Other investigations

D-dimer testing is not currently recommended for investigation of VTE in pregnancy.[9, 10] D-dimer levels progressively rise throughout pregnancy and remain elevated in the postpartum period.[10, 16] Additionally, there is some evidence to suggest that a normal D-dimer in pregnancy is insufficient to rule out VTE.[10] There is insufficient current evidence for pre-test probability assessment in pregnancy.[10, 16]

Prior to commencing therapeutic anticoagulation for treatment of VTE blood should be taken for full blood count, urea and electrolytes, liver function tests and coagulation studies, as the use of anticoagulants is influenced by renal and liver function.[10] Anticoagulants may also cause thrombocytopenia.[10]

There is no role for routine thrombophilia testing at the time of VTE diagnosis in pregnancy due to the physiological changes of pregnancy and pathophysiological changes in acute VTE.[10] The single exception to this rule is if the coagulation profile demonstrates a prolonged APTT at baseline, or if there is a clinical history of autoimmune disease, where targeted testing (anti-cardiolipin / anti-β2-glycoprotein 1 antibodies, lupus anticoagulant assay) may have long-term implications for management. Thrombophilia testing may be considered once anticoagulants have been ceased if the results are likely to change the woman's future management.[10]

Management

Anticoagulant therapy

When DVT or PE is suspected, low-molecular-weight heparin (LMWH) should be commenced and continued until the diagnosis is excluded, except in women at a high risk of bleeding.[10]

LMWH is the preferred anticoagulant the majority of women with newly diagnosed VTE in pregnancy. See section on Therapeutic anticoagulation regarding initiation and dosing.

In women at a high risk of bleeding (e.g. ante/postpartum haemorrhage, coagulopathy), UFH is preferred for initial therapy as it has a shorter half-life and can be completely reversed with protamine sulphate.[9, 10] UFH may also be preferred in patients with severe renal failure (eGFR <30mL/minute/1.73m^2).[4] UFH does not cross the placenta and thus is safe for the fetus.[4] Monitor the platelet count every 2-3 days between day 4 and 14 [10] of UFH treatment given the risk of HIT.

Vitamin K antagonists, (e.g. warfarin) should not be used to treat VTE in pregnancy due to the risk of adverse pregnancy outcomes. These include warfarin embryopathy (particularly when used in the first trimester), miscarriage, preterm birth, low birth weight, neurodevelopmental problems and fetal / neonatal bleeding.[2, 4, 9, 10, 14]

While there have been no formal studies of the DOACs in pregnancy, some of these agents have been reported to have toxic effects in animal studies. They are likely to cross the placenta, impair fetal haemostasis and are not recommended for use in pregnancy.[2, 4, 10]

Consult a Haematologist for patients with thrombocytopenia prior to or developing during treatment,

Obstetric factors

Maternal circulatory compromise or hypoxia may have adverse effects on the fetus and additional fetal monitoring may be required. The type and frequency of such monitoring is determined by gestational age and severity of maternal illness. In the absence of maternal compromise, additional monitoring is unlikely to be necessary.[17]

The mode of delivery in stable women with recent VTE should be determined on standard obstetric grounds. [17]

Potential contraindications to anticoagulation

Refer to section 'Risk Factors for Bleeding'.

Mechanical treatment

Correctly fitted graduated compression stockings and early mobilisation should be encouraged in pregnant women with DVT (including proximal DVT) in order to reduce pain and swelling.[10] A bed cradle is also helpful when the leg is very painful.

Alternative anticoagulants

Therapeutic LMWH during pregnancy has is a relatively high incidence (19.8%) of delayed-type hypersensitivity reactions (median time to onset 50.5 days).[10] Cross-reactivity with alternate LMWHs is common (33.3% in one study). Danaparoid, a low-molecular-weight heparinoid, may be a useful alternative.[4, 10] Danaparoid has not been found to be associated with adverse fetal effects and is considered safe to use in breastfeeding.[2, 4] Consult a Haematologist.

Inferior vena cava filters

IVC filters are inserted via venous puncture and reduce the risk of PE. They do not reduce the overall risk of VTE, however, and are associated with a number of procedural complications. IVC filter insertion may be considered in patients with VTE where anticoagulation is contra-indicated due to bleeding risk[4, 9, 10] or in whom recurrent PE would be catastrophic. **IVC filter insertion should be discussed with a Haematologist.**

Management of massive PE

Pregnant women with massive PE may present with shock, refractory hypoxaemia and/or right ventricular dysfunction on echocardiogram.[10] Massive PE is a medical emergency and should be assessed and managed by a multidisciplinary team including consultant Physicians, Obstetricians, Radiologists, Cardiothoracic Surgeons, Intensivists And Haematologists.[10]

Intravenous UFH is generally the anticoagulant of choice for massive PE as it can be rapidly adjusted in response to evolving management decisions.[4, 10] UFH should be prescribed on the WA Anticoagulation Medication Chart (MR 810.11). Discuss target APTT and bolus heparin with a Haematologist.

In massive PE with haemodynamic instability or iliofemoral vein thrombosis with life or limb threatening ischaemic complications, thrombolytic therapy may be required.[4, 10] Thrombolytic therapy should be followed by an infusion of UFH, typically without bolus dosing).[10] Thrombolysis of massive PE is associated with a significant reduction in PE recurrence and death. In pregnancy, thrombolytic therapy carries

major risks of maternal haemorrhage (incidence of non-fatal major bleeding 30.8%), preterm labour (incidence 38.5%), placental abruption and fetal demise (incidence 15.4%).[9, 10] Careful consideration of the benefits and risks is critical.[9]

Urgent thoracotomy and thrombectomy should be considered in patients with massive PE if moribund or unsuitable for thrombolysis.[10]

Duration of treatment

- Duration of treatment should be individualised, taking into consideration the size/nature of the VTE and presence/absence of provoking risk factors.
- In women with a **proximal** DVT or PE in pregnancy, therapeutic LMWH should be continued for a minimum period of 3 months, or until 6 weeks postpartum, whichever occurs later.
- In women with isolated **distal** DVT in pregnancy, therapeutic LMWH should be continued for a minimum period of 6 weeks before prophylactic LMWH for the remainder of pregnancy and 6 weeks post-partum.[10] Longer courses of treatment may be appropriate if there is residual thrombus on follow-up imaging or persistent risk factors.
- When changing to prophylactic anticoagulation the standard dose of LMWH is enoxaparin 40mg daily.[5]
- An initial period of inpatient management is appropriate for women with PE or **proximal** DVT. Provided ongoing stability they may then be managed as outpatients until birth.[9, 10]
- Outpatient management is suitable for women with **isolated distal** DVT, provided they are clinically stable, with good social support and the ability to return to hospital if required.[4, 10]

Patient information

The KEMH pharmacy provides written information to patients who are prescribed anticoagulants on discharge. Depending on the prescription, this may include:

- Department of Health WA:
  - Living with a New Oral Anticoagulant (NOAC) (external website, PDF, 912KB)
  - Living with Warfarin (external website, PDF, 1.19MB)
- Clexane Sanofi: Preventing and Treating Blood Clots (external website, PDF, 2.03MB) and product information leaflet.

Compliance and evaluation

WNHS monitors compliance with this guideline through local quality improvement activities and routine data collection on Hospital Acquired Complications (HACs) (e.g. hospital-acquired DVT / PE, and haemorrhagic disorder due to anticoagulants).

Indicators to support local monitoring activities can be found on the ACSQHC VTE Prevention Clinical Care Standard and METeOR (external website). ACSQHC suggested indicators include the proportion of patients who are:

- admitted to hospital and assessed for VTE risk within 24 hours of admission with the risk assessment outcome documented in the medical record (e.g. WA HMC)
- prescribed appropriate VTE prophylaxis (based on their VTE / bleeding risks)
- separated from hospital on VTE prophylaxis with a care plan documenting prescribed medicine(s), dose, and duration of treatment

Note- If any hyperlinks to ACSQHC / METeOR resources are not working in Internet Explorer- try copying the link to a different browser (e.g. Edge or Chrome).

Abbreviations

ACSQHC	Australian Commission on Safety and Quality in Health Care	**IV**	Intravenous
APTT	Activated partial thromboplastin time	**IVC**	Inferior vena cava
BMI	Body mass index	**JVP**	Jugular venous pressure
CS	Caesarean section	**KEMH**	King Edward Memorial Hospital
CT	Computed tomography scan	**LFT**	Liver function test
CTPA	Computed tomography pulmonary angiogram	**LMWH**	Low-molecular-weight heparin
CXR	Chest X-ray	**PE**	Pulmonary embolism
DBP	Diastolic blood pressure	**SBP**	Systolic blood pressure
DOAC	Direct oral anticoagulants	**Subcut**	Subcutaneous
DVT	Deep vein thrombosis	**U&E**	Urea and electrolytes
ECG	Electrocardiogram	**UFH**	Unfractionated heparin
GCS	Graduated compression stockings	**UK**	United Kingdom
eGFR	Estimated glomerular filtration rate	**USA**	United States of America
HIT	Heparin induced thrombocytopenia	**V/Q**	Ventilation/perfusion
INR	International normalised ratio	**VTE**	Venous thromboembolism
IPPC	Intermittent pneumatic calf compression	**WA HMC**	WA Hospital Medication Chart

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Related legislation, policies and standards

Australian Commission on Safety and Quality in Health Care: Clinical Care Standards: Venous Thromboembolism Prevention Clinical Care Standard (Oct 2018) (external site, PDF, 4MB)

Department of Health WA: Mandatory Policy (MP 0131/20) High Risk Medication Policy; WA Anticoagulation Medication Chart (website): Guidelines for the WA Anticoagulation Medication Chart (WA AMC)

Note- If any hyperlinks to external resources are not working in Internet Explorer- try copying the link to a different browser (e.g. Edge or Chrome).

Related NMHS, WNHS policies, procedures and guidelines

KEMH Clinical Guidelines:

Anaesthetics guidelines: Labour and Post-operative pain management (available to WA Health staff via Healthpoint): Epidural Catheter Removal, 'Management of LMWH, UFH and Neuraxial Blockade'

Obstetrics & Gynaecology:

- Caesarean Section

- Cardiac Conditions

Pharmacy guidelines:

- Pre-operative Medication Management (available to WA Health employees throughHealthpoint)
- Medications- Enoxaparin; Heparin; Warfarin

Pharmacy Learning Hub - WA Anticoagulation Medication Chart Presentation Slides

SCGH-OPH NPG No30: Venous Thromboembolism Prophylaxis

Useful resources (including related forms)

Patient information:

- ACSQHC: VTE Consumer Fact Sheet Quick Facts (external website, PDF, 189KB)
- Department of Health WA:
  - Living with a New Oral Anticoagulant (NOAC) (external website, PDF, 912KB)
  - Living with Warfarin (external website, PDF, 1.19MB)
- Clexane Sanofi: Preventing and Treating Blood Clots (external website, PDF, 2.03MB) and product information leaflet

Forms

MR 250 Progress Notes

MR 315 Operation Record

MR 810.05 WA Hospital Medication Chart

MR 810.11 Anticoagulant Medication Chart

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Version history

Version number	Date	Summary
1	July 2021	First version. For a list of changes- see OGD Guideline Updates by month/year of review date. **History**: In July 2021 amalgamated eight individual guidelines on venous thrombo embolism dating from Dec 1990. **Supersedes**: 1. Risk assessment and recommended venous thromboembolic prophylaxis in patients admitted for Gynaecological conditions (last amended May 2016) 2. Prophylaxis for Women with a Prior Thrombotic Event in whom no Thrombophilia has been Identified (dated Sept 2014) 3. Antenatal Prophylaxis for Women with Proven Thrombophilia and a Previous Thrombotic Event (dated Nov 2015) 4. Thromboprophylaxis after Caesarean Birth (last amended Feb 2015) 5. Venous Thrombosis Occurring in the Present Pregnancy (dated Feb 2019) 6. Graduated Compression Stockings (dated Oct 2018) 7. Intravenous Heparin Therapy (dated July 2018) 8. Pre and Post Operative Management of Patients on Therapeutic Warfarin Anticoagulation (gynaecology) (dated July 2018)

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