Clinical Practice Guideline
Thromboprophylaxis Guidelines

TABLE OF CONTENTS

1. INTRODUCTION

Venous thromboembolism (VTE) comprises deep vein thrombosis (DVT) and pulmonary embolism (PE). It is a common cause of preventable death in hospitalised patients [1, 2]. Treatment of non-fatal VTE and its long-term complications such as post-thrombotic syndrome is associated with considerable cost to the healthcare. Evidence suggests that thromboprophylaxis is of pivotal importance in reducing the mortality and morbidity of venous thromboembolism.

2. PURPOSE

This guideline provides recommendations to ensure safe and appropriate thromboprophylaxis for adult inpatients to reduce the risk of venous thromboembolism.
It aims to:

- Provide a checklist of practical considerations when conducting thromboembolism risk assessment, and subsequently, groups of patients that would benefit from chemical and/or mechanical thromboprophylaxis
- Provide a guide for thromboprophylaxis dosing in surgical, medical, critical care, pregnancy and childbirth patients, considering weight and renal function and

3. SCOPE

This guideline provides information for medical, nursing, pharmacy and allied health staff across Peninsula Health.

4. DEFINITIONS

BMI =Body Mass Index
CrCl = Creatinine Clearance
GCS= Graduated Compression Stocking
HIT = Heparin induced thrombocytopaenia
HITTS = Heparin induced thrombocytopaenia thrombosis syndrome
IPC = Intermittent Pneumatic Compression
LMWH = Low Molecular Weight Heparin
NOACs = Non-Vitamin K Oral Anticoagulants
S/C = Subcutaneous
VTE = Venous Thromboembolism consisting of pulmonary embolism and deep vein thrombosis

5. CLINICAL PRACTICE GUIDELINE

It is the responsibility of all Peninsula Health staff involved in the assessment, investigation, planning, care delivery or treatment of a patient irrespective of the care situation to ensure they are providing the right care to the right patient at all times by positively identifying the patient prior to any consultation.
The three approved identifiers at Peninsula Health are patient name (family and given), date of birth and Unit Record (UR) number. In the absence of a UR number or when a new patient is being registered, the patient address can be used until a UR number is assigned.
To correctly identify a patient, the patient or representative should be asked to state their full name (family and given) and date of birth and always check this against the patient identification band and/or labelled documentation.

6. INDICATIONS

Prevention of VTE in hospitalised adult inpatients including medical, surgical, orthopaedic, critical care patients and in pregnancy and childbirth.

7. VENOUS THROMBOEMBOLISM (VTE) RISK ASSESSMENT

- Risk assessment is to be completed by medical staff for all patients admitted for an overnight stay or longer.
- Assessment should be completed and documented electronically in the clinical system using the Clover VTE risk assessment discern alert tool [3]. Refer to the Clover Clinical Systems Reference Guides available on the intranet.
- Risk assessment needs to be reviewed at regular intervals and/or at any time the patient's clinical status changes. Contraindications present at the initial assessment may not persist for longer periods of stay.
- Risk assessment involves consideration of the patient's
    - venous thromboembolism (VTE) risk (see Table 1),
    - bleeding risk [and thus contraindications/precautions to thromboprophylaxis (see Table 2)],
    - renal function and
    - weight

- All patients must be asked if they have had an adverse reaction to heparin or low molecular weight heparin (LMWH), a history of Heparin Induced Thrombocytopenia (HIT) or Heparin Induced Thrombocytopenia and Thrombosis Syndrome (HITTS) and the response must be documented in the clinical system.

7.1 Thromboembolic risk factors

Table 1: VTE risk factors [2, 4, 5, 6, 7]

VTE risk factors include but are not limited to the following:	
Active inflammation (eg. Flare of inflammatory bowel disease) Acute neurological condition Congestive cardiac failure (NYHA Class III or IV) Erythropoiesis stimulating agents Reduced mobility Increasing age (> 60 years) Ischaemic stroke (except recent large thromboembolic stroke which could be a bleeding risk) Major trauma/burns Malignancy Myeloproliferative neoplasm Nephrotic syndrome	Obesity (BMI > 30) Oestrogen therapy Pregnancy or puerperium Presence of central line Previous VTE Recent myocardial infarction Respiratory failure Selective oestrogen receptor modulators Sepsis/ Acute infection Strong family history of VTE Thrombophilia Varicose veins Sedated patients including mental health patients Intermittent ambulant Mental health clients

8. FIRST LINE THERAPY: PHARMACOLOGICAL PROPHYLAXIS

- Enoxaparin 40mg daily, dose adjustment is required in renal impairment and at the extremes of weight
- **If Enoxaparin is not appropriate due to allergy or other reasons, please consult haematology or pharmacy**

Medical VTE prophylaxis Guide- Refer to Figure 1

8.1 Dosing for Impaired Renal Function

- Enoxaparin is renally eliminated hence dosage adjustments may be required in renal impairment.

CrCl > 30ml/min: Enoxaparin 40mg daily subcutaneous CrCl < 30ml/min: Enoxaparin 20mg daily subcutaneous

- Haematology or Pharmacy can be consulted to discuss dosage adjustments
- For NOACs, please refer to Peninsula Health Policy Clinical Practice Guidelines - Non-Vitamin K Oral Anticoagulants (NOAC, DOAC, RIVAROXABAN, DABIGATRAN, APIXABAN) for dosage adjustments.

8.2 Bleeding Risks/Contraindications

- Each patient's VTE risk and bleeding risk must be reviewed on a case to case basis
- Consider contacting haematology for advice

Table 2: Contraindications to chemical thromboprophylaxis [2, 4, 5, 6, 8, 9]

Contraindications include but are not limited to the following:

Absolute contraindications	**Relative contraindications**
Active bleeding* High risk of bleeding e.g. haemophilia Current anticoagulation Recent intraocular or intracranial surgery Lumbar puncture or epidural anaesthesia Severe hypertension (BP> 200/120) Thrombocytopenia (platelet count <50 x 10^9 /L) Very high falls risk	Cerebral metastatic disease Palliative management Recent large thromboembolic stroke (to liaise with neurologist regarding safety of VTE prophylaxis) Bacterial endocarditis Severe hepatic disease (INR>1.5)
Caution: Caution needs to be exercised in the following: Pregnancy Liver and renal disease Weight < 40kg Adverse reaction to heparin (consult with Haematology regarding alternative agents available including danaparoid and fondaparinux) Past history of haemorrhagic stroke (patients with intracerebral haemorrhage should be considered for chemical prophylaxis one to four days after documented cessation of bleeding) Recent history of GI bleeding	

***Active bleeding is defined as requiring at least two units of blood/blood products to be transfused in 24 hours [2, 5]

9. SECOND LINE THERAPY: MECHANICAL PROPHYLAXIS

- Consists of Graduated Compression Stockings (GCS) of which TEDS are well known and Intermittent Pneumatic Compression devices (IPC)
- Mechanical prophylaxis is usually suitable for patients assessed as HIGH risk of venous thromboembolism where it is not contraindicated.
- Alternatively, mechanical prophylaxis can be used when patients are at HIGH risk for VTE, however their bleeding risk precludes the use of pharmacological prophylaxis [10].
- Bleeding risk should be reassessed and pharmacological prophylaxis should be considered once bleeding risk decreases [10]

9.1 Intermittent Pneumatic Compression (IPCs)

- IPCs are more effective at reducing the incidence of VTE than GCS in high risk patients
- Patients at risk of bleeding should have IPCs applied in the ward or ICU as soon as possible
- IPCs should be used during the entire period of immobility and removed when the patient is fully ambulant to reduce the risk of falls
- IPC is recommended for patients with intracerebral haemorrhage from the first day of their admission to hospital [9]

9.2 Graduated Compression Stockings (GCS)

- No high-quality evidence to suggest the addition of GCS to pharmacological prophylaxis
- GCS when used alone are inferior to pharmacological prophylaxis in VTE prevention and increase the risk of falls and pressure injuries
- GCS should only be used when pharmacological therapy is contraindicated and IPCS are not available or also contraindicated
- If GCS are used, correct measurement of the patient's legs is required to select the appropriate stocking size.
- Details of GCS use (e.g. left leg only, right leg only or both legs) must be documented in the nursing care plan
- The GCS should be removed regularly to inspect skin condition. Discontinue use if there is marking, blistering or discoloration of the skin, particularly over the heels and bony prominences or if the patient experiences pain/discomfort.
- It must be ensured that the patient wears non-slip footwear for ambulation.
- As thromboprophylaxis includes mechanical methods, awareness of when mechanical prophylaxis should NOT be used is important.

Table 3: Contraindications to mechanical prophylaxis [2, 5, 6]

Severe peripheral arterial disease Recent skin graft to leg Severe peripheral neuropathy Severe leg deformity preventing correct fit Severe lower limb oedema Morbid obesity preventing correct fit **Caution:** fragile skin e.g. elderly, chronic corticosteroid administration

10. CHEMICAL PROPHYLAXIS FOR SPECIFIC PATIENT GROUPS

10.1 Obese population:

It is well documented that standard doses of enoxaparin for VTE prophylaxis may not provide adequate protection in obese populations. Obesity has been defined by the National Institutes of Health as BMI between 30-40kg/m^2 and extreme/morbid obesity as BMI > 60kg/m^2. The Clexane® product information or guidelines that address VTE prophylaxis in obese populations does not make any recommendations regarding prophylactic doses in the obese patient [10, 11, 12]. Additional large, randomized, controlled trials are required to determine the appropriate doses.

In line with other metropolitan hospitals (such as the Alfred Hospital), the arbitrary weight of 130kg are considered at higher risk of VTE[7]. Please see table below for recommendations:

Patient Group	Recommendations
Weight < 130kg BUT BMI > 40kg/m^2	Consider haematology input
Weight > 130kg BUT BMI < 40kg/m^2	Enoxaparin 40mg BD (or enoxaparin 60mg daily for convenience of administration)
BMI > 40kg/m^2 (morbid obesity)	Enoxaparin 40mg BD*
BMI > 60 kg/m^2 (extreme obesity)	Haematology input strongly recommended

*in morbid obesity patients this dose of enoxaparin is the most validated in prevention of VTE[13]

10.2 Underweight population:

There is limited evidence for dosing underweight patients. For patients < 50kg consider a reduced dose of enoxaparin 20mg daily [7]. Consultation with haematology is recommended. Careful clinical observation is required.

10.3 Epidural and Regional Anaesthesia

- The anaesthetist undertaking the cathedral insertion will determine when pharmacological prophylaxis should be recommenced post catheter insertion. The decision depends on patient risk factors, the presence of blood during catheter insertion and consultation with the surgical unit involved

- Subsequent pharmacological prophylaxis is withheld for 4 hours post catheter removal and complete resolution of the block [14, 15]

10.4 Pregnancy and Childbirth:

Pregnant women have up to a ten-fold increase in VTE risk compared to non-pregnant women [5]. It is a leading cause of maternal deaths in the developed world and the second most common cause of direct maternal death in Australia [16]. Hospitalisation during pregnancy is associated with an 18-fold increased risk of VTE [17].The risk is even higher if delivery is by caesarean section, especially emergency caesarean section [5, 17], However, there is limited high level evidence from randomised trials or among evidence based/consensus guidelines about which women require thromboprophylaxis during pregnancy and postpartum.

- Women admitted to hospital that are pregnant or have given birth within the previous six weeks should be considered for pharmacological and/or mechanical prophylaxis after **risk assessment** has been performed, especially if additional VTE risk factors exist (see Figure 1 for risk factors) [2, 17].

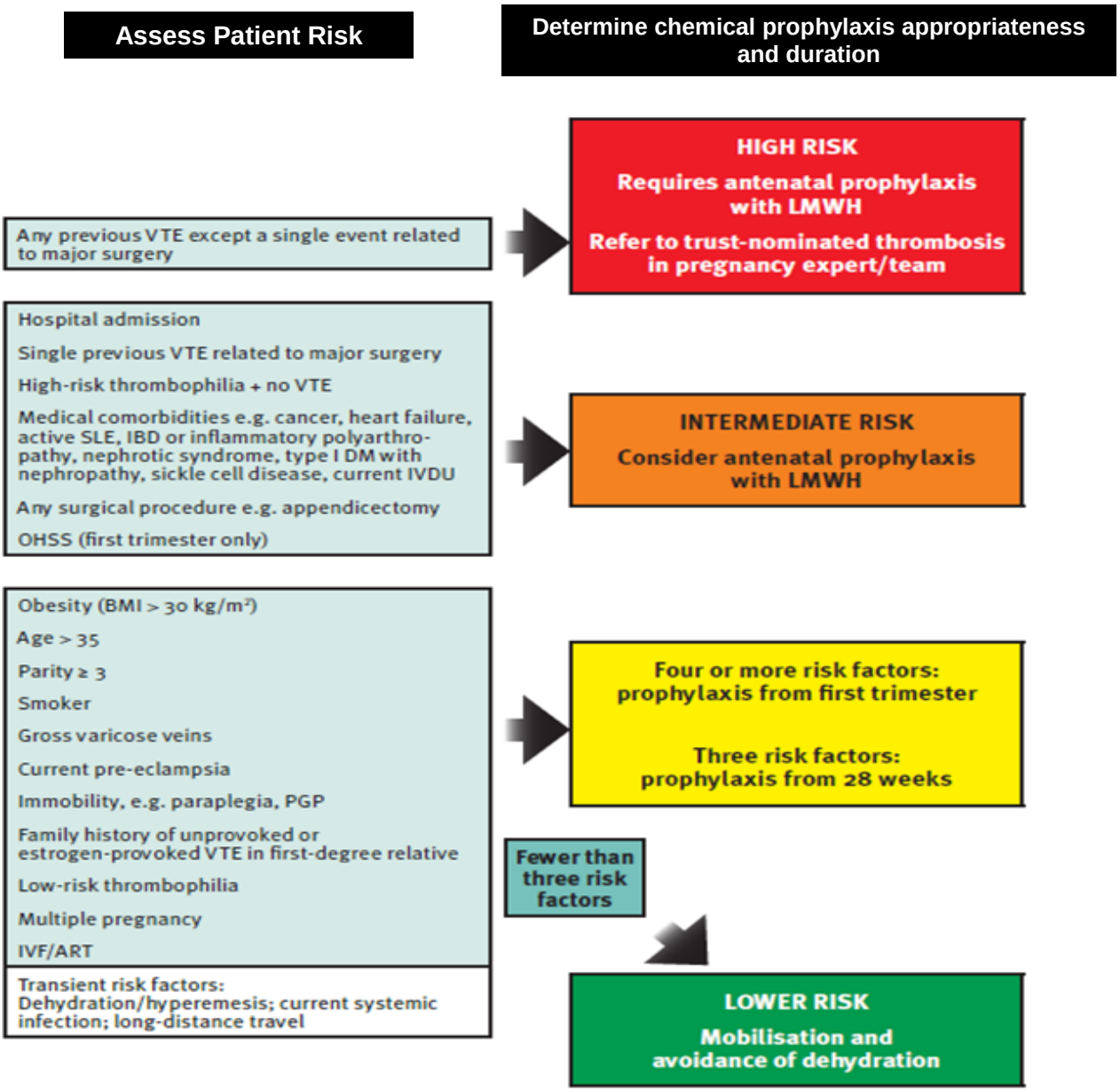
- All women should have risk factors for VTE assessed in their pregnancy and upon admission to hospital
- Risk factors and management for women at risk of VTE should be documented in the Birth Outcomes System (BOS)
- Women with a previous thrombosis or a thrombophilia should have an antenatal, intrapartum and postpartum plan discussed with a haematologist. This plan should be documented in the Birth Outcomes System (BOS).
- All woman who have delivered by caesarean, who don't have contraindications, should receive LMWH (enoxaparin) until discharge. Women with risk factors may require a longer duration of LMWH enoxaparin (see Figure 2). This can be arranged through Domiciliary Care (for limited additional doses), HITH, through the GP, or by training the woman or a carer to administer the treatment.
- Mechanical prophylaxis can be used alone in women who have contraindications to LMWH [17].
- LMWH (enoxaparin) is the pharmacological agent of choice for thromboprophylaxis in pregnancy and childbirth.

Table 4: Suggested antenatal and postnatal prophylactic doses of enoxaparin* [adapted from Appendix I Green-top Guidelines No. 37a Royal College of Obstetricians and Gynaecologist 2015]

Weight < 50kg	20mg enoxaparin
Weight 50-90kg	40mg enoxaparin
Weight 91-130kg	60mg enoxaparin
Weight 131-170kg	80mg enoxaparin
Weight > 170kg	0.6mg/kg/day enoxaparin
*Doses are for normal renal function; dose reduction is required in women with renal impairment	

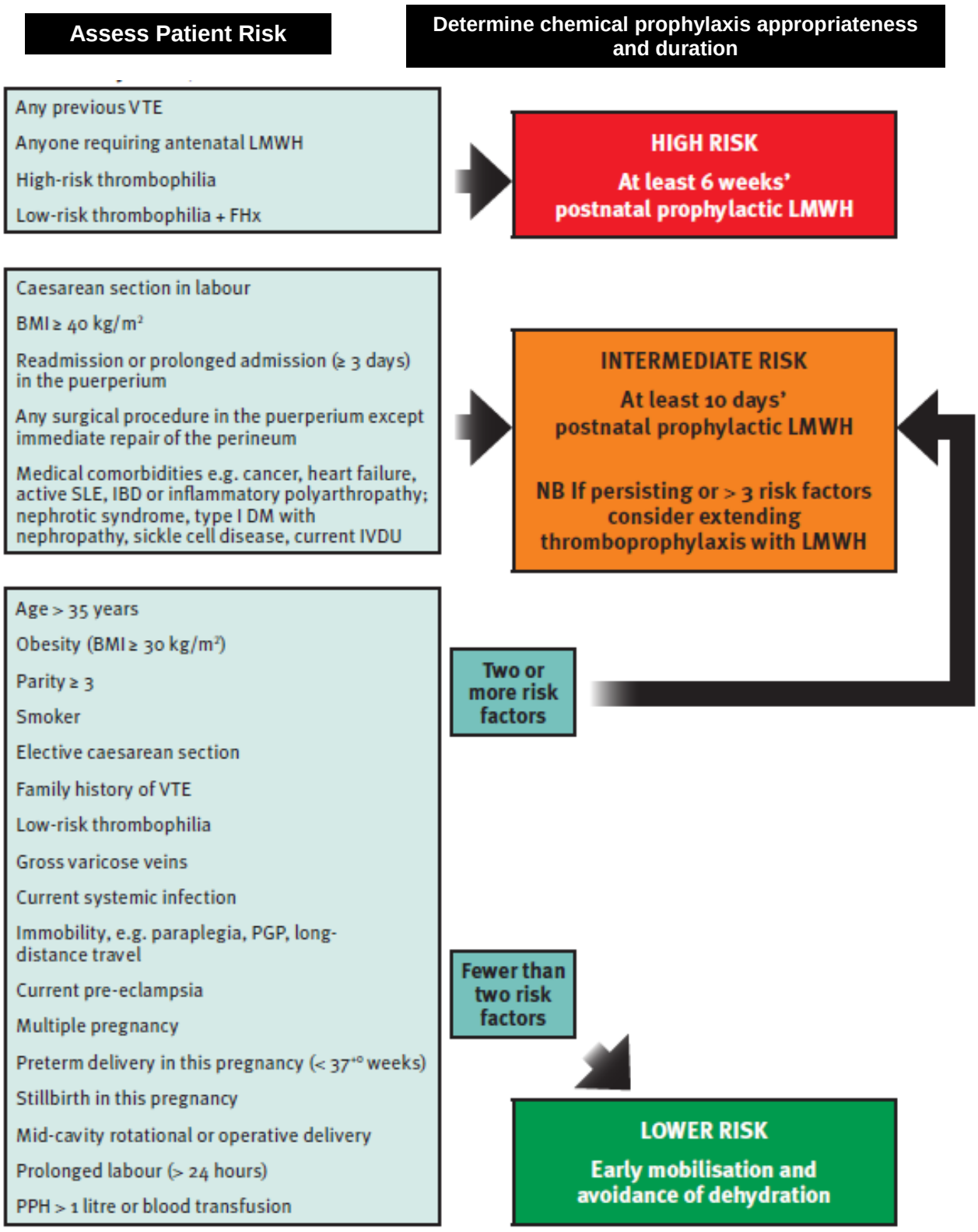
- All pharmacological prophylaxis should be stopped 12 hours before anticipated delivery [17].
- Thromboprophylaxis with enoxaparin should begin as soon as possible after delivery provided there is no postpartum haemorrhage and regional anaesthesia has not been used [17].
- For women who fall outside of these guidelines and those not considered high risk patients but may require pharmacological thromboprophylaxis, consult the obstetrician and haematologist and other relevant specialities.

Figure 1: Antenatal VTE prophylaxis [17]:



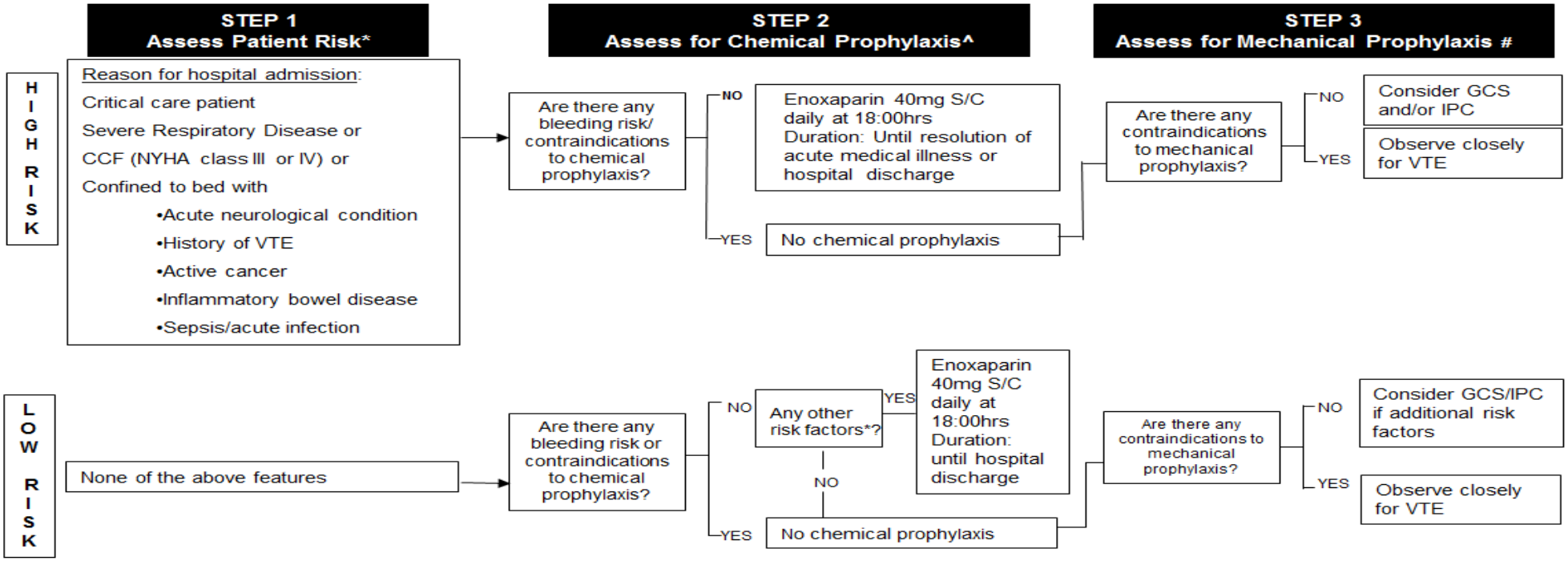
APL = antiphospholipid antibodies (lupus anticoagulant, anticardiolipin antibodies, β_2-glycoprotein 1 antibodies); ART = assisted reproductive technology; BMI based on booking weight; DM = diabetes mellitus; FHx = family history; gross varicose veins = symptomatic, above knee or associated with phlebitis/oedema/skin changes; high-risk thrombophilia = antithrombin deficiency, protein C or S deficiency, compound or homozygous for low-risk thrombophilias; IBD = inflammatory bowel disease; immobility = ≥ 3 days; IVDU = intravenous drug user; IVF = in vitro fertilisation; LMWH = low-molecular-weight heparin; long-distance travel = > 4 hours; low-risk thrombophilia = heterozygous for factor V Leiden or prothrombin G20210A mutations; OHSS = ovarian hyperstimulation syndrome; PGP = pelvic girdle pain with reduced mobility; PPH = postpartum haemorrhage; thrombophilia = inherited or acquired; VTE = venous thromboembolism.

Figure 2: Postnatal VTE prophylaxis [17]:



11. MEDICAL VTE PROPHYLAXIS GUIDE -Refer to Figure 1

Figure 1: VTE prophylaxis in medical inpatients [2, 4, 5, 6]
(See Clinical Practice Guideline – Thromboprophylaxis Guidelines for full details)



* Refer to Table 1 in the guidelines for additional VTE risk factors when assessing the patient's thromboembolic risk, considering all mental health patients.

^ Refer to Table 2 in the guidelines for contraindications to pharmacological prophylaxis when assessing the appropriateness of using chemical thromboprophylaxis

Refer to Table 3 in the guidelines for contraindications to mechanical prophylaxis when assessing the appropriateness of using mechanical prophylaxis

12. SURGICAL VTE PROPHYLAXIS GUIDE – Refer to Figure 4

Risk assessment of surgical patients also involves consideration of VTE risk as well as bleeding risk associated with the surgery.

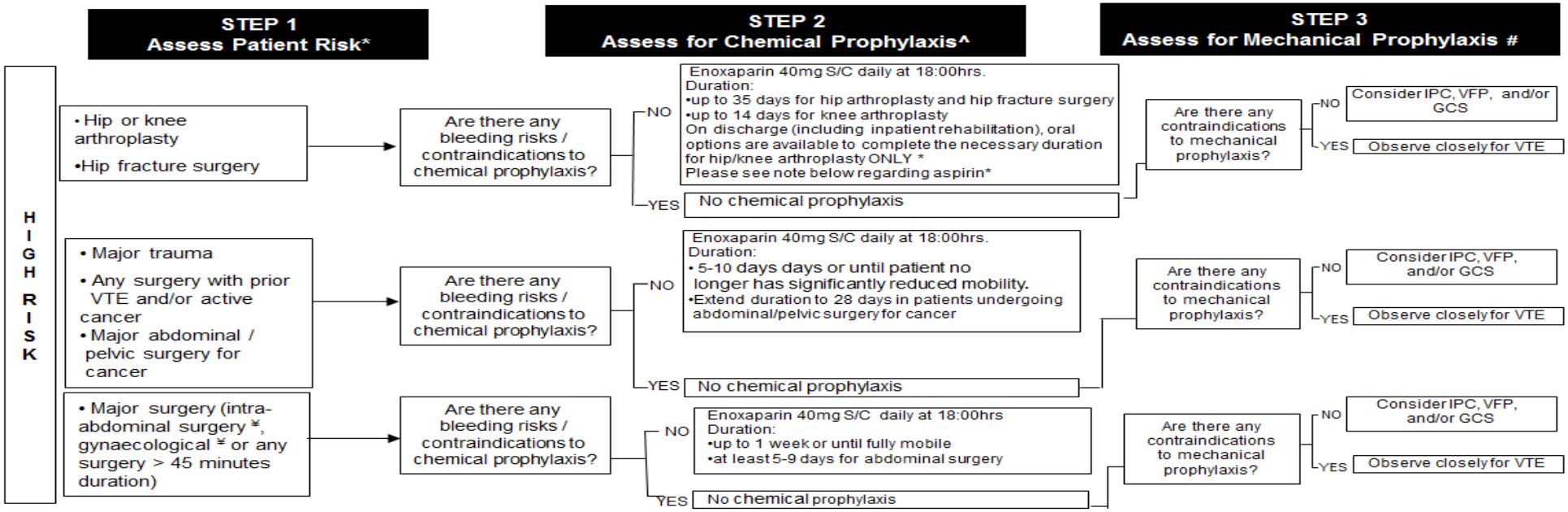
Surgeries that place a patient at increased risk of VTE are indicated in Figure 4.

Table 6 lists examples of surgeries and their relative bleeding risk.

Table 6: Examples of surgical procedures and their bleeding risk [18]

NO CLINICALLY IMPORTANT BLEEDING RISK	SOME EXAMPLES OF SURGERY WITH LOW BLEEDING RISK	SOME EXAMPLES OF SURGERY WITH HIGH BLEEDING RISK
• DENTAL INTERVENTIONS SUCH AS; EXTRACTION OF 1 TO 3 TEETH, PERIODONTAL SURGERY, INCISION OF ABSCESS AND IMPLANT POSITIONING.CATARACT OR GLAUCOMA INTERVENTIONS. • ENDOSCOPY WITHOUT SURGERY. • MINOR SURGERY (E.G. ABSCESS INCISION AND SMALL DERMATOLOGIC EXCISIONS).	• ENDOSCOPY WITH BIOPSY. • PROSTATE OR BLADDER BIOPSY. • ELECTROPHYSIOLOGICAL STUDY OR RADIOFREQUENCY CATHETER ABLATION FOR SUPRAVENTRICULAR TACHYCARDIA (INCLUDING LEFT-SIDED ABLATION VIA SINGLE TRANS-SEPTAL PUNCTURE). • ANGIOGRAPHY. • PACEMAKER OR IMPLANTABLE CARDIOVERTER DEFIBRILLATOR (ICD) IMPLANTATION (UNLESS COMPLEX ANATOMICAL SETTING, E.G. CONGENITAL HEART DISEASE).	• COMPLEX LEFT-SIDED ABLATION (PULMONARY VEIN ISOLATION; VT ABLATION). • SPINAL OR EPIDURAL ANAESTHESIA. • LUMBAR DIAGNOSTIC PUNCTURE. • THORACIC SURGERY. • ABDOMINAL SURGERY. • MAJOR ORTHOPAEDIC SURGERY. • LIVER BIOPSY. • TRANSURETHRAL PROSTATE RESECTION. • KIDNEY BIOPSY.

Figure 2: VTE prophylaxis in surgical inpatients [2, 4, 5, 8]
(See Clinical Practice Guideline – Thromboprophylaxis Guidelines for full details)



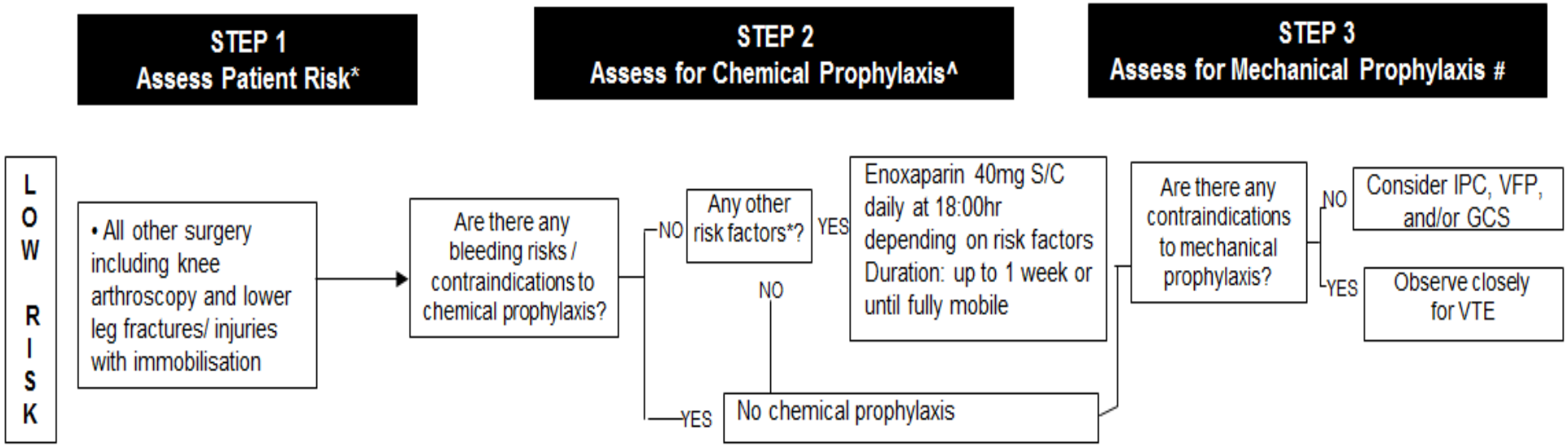
*Oral options include the following [refer to Peninsula Health Policy Clinical Practice Guidelines - Non-Vitamin K Oral Anticoagulants (NOAC, DOAC, RIVAROXABAN, DABIGATRAN, APIXABAN) & individual product information to consider most appropriate choice for the patient]:
- Apixaban: 2.5mg twice daily
- Dabigatran: 220mg daily
- Rivaroxaban: 10mg daily

** Enoxaparin remains **first line** for hip or knee arthroplasties and hip fracture surgery [11]:
- Aspirin 100mg daily should only be considered if there is an **absolute contraindication** to enoxaparin

¥ Patients deemed to be at very low risk or low risk may not require chemical prophylaxis [8]

* Refer to Table 1 in the guidelines for additional VTE risk factors when assessing the patient's thromboembolic risk.
^ Refer to Table 2 in the guidelines for contraindications topharmacological prophylaxis when assessing the appropriateness of using chemical thromboprophylaxis
# Refer to Table 3 in the guidelines for contraindications to mechanical prophylaxis when assessing the appropriateness of using mechanical prophylaxis

Figure 2 cont: VTE prophylaxis in surgical inpatients [2, 5, 6, 8]
(See Clinical Practice Guideline – Thromboprophylaxis Guidelines for full details)



* Refer to Table 1 in the guidelines for additional VTE risk factors when assessing the patient's thromboembolic risk.
^ Refer to Table 2 in the guidelines for contraindications to pharmacological prophylaxis when assessing the appropriateness of using chemical thromboprophylaxis
# Refer to Table 3 in the guidelines for contraindications to mechanical prophylaxis when assessing the appropriateness of using mechanical prophylaxis

13. EVALUATION

A range of tools will be used to evaluate procedure compliance. Feedback systems such as incident reports, complaints, performance indicators and specific audit will be used to facilitate evaluation of compliance and the uptake of the electronic Clover VTE risk assessment discern alert tool. Feedback will be used to review the Clinical Practice Guideline.

14. KEY ALIGNED DOCUMENTS

- Peninsula Health Policy Clinical Practice Guidelines - Administration of Prothrombinex – VF (Warfarin Reversal)
- Peninsula Health Policy - Clover Clinical Systems Reference Guides – Medical Officer: VTE
- Peninsula Health Policy - Hand Hygiene & Aseptic Technique
- Peninsula Health Policy - Medication Management
- Peninsula Health Policy Clinical Practice Guidelines - Non- Vitamin K Oral Anticoagulants (NOAC, DOAC, RIVAROXABAN, DABIGATRAN, APIXABAN)
- Peninsula Health Policy – Pre-Operative/Medical Interventions: Patient Safety Checking Procedure
- Peninsula Health Policy Clinical Practice Guidelines – perioperative antithrombotic management in surgical and invasive procedures

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