Clinical Guideline

Venothromboembolism prophylaxis: Trauma and Orthopaedics

Venous thromboembolism (VTE) is a recognised complication associated with inactivity and surgical procedures. Therefore, all patients undergoing orthopaedic elective or trauma surgery should be assessed to establish their risk factors for developing VTE and an agreed treatment regimen should be implemented.

NOTE: These guidelines are not intended to cover patients who are already admitted on warfarin therapy or those suspected of suffering from a thromboembolic event.

These are guidelines only and can be deviated from if it is thought to be in the patient's best interest.

1. Completing risk assessments

VTE assessments should be completed using the electronic VTE assessment pathway that is accessed from the electronic patient record system (PCIS). These assessments require the identification of the following risk factors for thrombosis and bleeding.

Thrombosis Risk Factors

a)	Active cancer or cancer treatment	2pts
b)	Age >60yrs	1pt
c)	Dehydration	1pt
d)	Known Thrombophilias / Hypercoagulation state (eg, Protein C or S or AT III deficiency, Factor V Leiden, Lupus anticoagulant, Prothrombin gene mutation)	4pts
e)	Obesity (BMI > 30 kg/m^2)	1pt
f)	One or more significant medical comorbidities (eg, Heart Disease, metabolic, endocrine or respiratory pathologies, acute infectious diseases, inflammatory conditions)	1pt
g)	Previous personal history of DVT/PE (requiring warfarinisation) < 5yrs ago	4pts
h)	Previous personal history of DVT/PE (requiring warfarinisation) > 5yrs ago or first degree relative with a history of DVT/PE	3pts
h)	Varicose veins with phlebitis	1pts
i)	Significantly reduced mobility for 3 days or more	2pts
j)	Acute surgical admission with inflammatory or Intra-abdominal condition	1pt
k)	Critical Care admission	2pts
l)	Use of hormone replacement therapy	2pts
m)	Use of oestrogen -containing contraceptive therapy	2pts
n)	Pregnancy or <6weeks post partum (see NICE guidance for specific risk factors)	Not part of scoring system, seek specialist advice on thromboprophylaxis

Risk category calculated by electronic VTE assessment pathway

0–2	3	4 or More
LOW	**MODERATE**	**HIGH**

Bleeding Risk Factors

a) Active bleeding
b) Acquired bleeding disorders (such as acute liver failure)
c) Concurrent use of anticoagulants known to increase the risk of bleeding (such as warfarin with INR >2)
d) Acute stroke
e) Thrombocytopaenia (platelets<75x10^9/L)
f) Uncontrolled systolic hypertension (230/120mmHg or higher)
g) Untreated inherited bleeding disorders (such as haemophilia and von Willebrand's disease)
h) Neurosurgery, spinal surgery or eye surgery
i) Other procedure with high bleeding risk
j) Lumbar puncture/epidural/spinal anaesthesia expected within the next 12 hours
k) Lumbar puncture/epidural/spinal anaesthesia within the previous 4 hours
l) No identified bleeding risk

2. Treatment recommendations

Once the assessment form has been completed, the system will recommend a treatment based on the procedure/operation being carried out and the patient's thrombosis risk factor.

NOTE: If any bleeding risks are present, it is for clinical staff to decide whether the risk is sufficient to preclude pharmacological intervention.

The treatments recommended are based on the tables in Appendix 1. Treatment recommendations are based on each patient's renal function, which is estimated using the Cockcroft & Gault equation (see Appendix 2).

Patients taking antiplatelets/anticoagulants

For major, elective lower-limb orthopaedic surgery, aspirin and clopidogrel are usually terminated 7–14 days prior to surgery (as advised during preoperative assessment). These treatments can be recommenced once perioperative anticoagulation treatment is terminated (ie, the day after enoxaparin or rivaroxaban are discontinued). In specific cases, this regimen may be deviated from depending on specific medical needs (eg, cardiac status).

Patients who are taking warfarin require an individualised VTE regimen — this should be determined by the orthopaedic consultant managing their care.

Two-stage revision arthroplasty

Two-stage revision arthroplasty surgery requires consideration of enoxaparin therapy after the first stage, followed by enoxaparin **OR** rivaroxaban after the second stage (unless contraindicated). The exact regimen needs to be agreed perioperatively by the surgical team.

Extended duration enoxaparin treatment

Hip fracture patients who have extended enoxaparin therapy prescribed post discharge should have their platelet counts and potassium levels monitored approximately one week post discharge and at weekly intervals thereafter to exclude potassium imbalance and heparin-induced thrombocytopenia.

3. Anti-embolism stockings

All inpatients are to be offered bilateral above knee anti-embolism stockings on admission to hospital. However, depending on surgical/injury site then unilateral or below knee stockings may be indicated. The following should be considered:

- For patients undergoing upper limb surgery, stockings should be applied to both legs before surgery.
- If lower limb surgery is being undertaken, a stocking should be applied to the non-operative leg prior to surgery. Where possible, a stocking (above or below knee) should be applied to the operative leg as soon as possible after surgery
- Stockings should be worn until the patient returns to their normal level of mobility.
- If a patient has diabetic neuropathy or severe peripheral vascular disease, stockings should **NOT** be applied — this should be documented in the patient's medical notes
- If above knee stockings are causing concerns regarding patient compliance or correct fit, below knee stockings can be used.

If a patient's risk/operative risk assessment advises enoxaparin or rivaroxaban therapy but the patient has a bleeding risk sufficient to preclude pharmacological intervention, foot compression pumps should also be prescribed. These are available from the Trauma Unit.

4. Auditing patient outcomes and compliance with guidelines

The Directorate VTE policy is currently being audited with regards to the side effects and success rate of the prophylaxis. Please inform Mr. Donnachie's Secretary (by telephone, Ex: 4303 or in writing) of any complications that may be partly or wholly attributable to the prophylaxis given (ie, wound haematoma, gastric bleeding, etc) or failure of prophylaxis (ie, proven DVT/PE) within 3 months of surgery.

References

- Venous thromboembolism: reducing the risk of venous thromboembolism (deep vein thrombosis and pulmonary embolism) in inpatients undergoing surgery. NICE clinical guideline 46 (April 2007).
- Rivaroxaban for the prevention of venous thromboembolism after total hip or total knee replacement in adults. NICE Technology Appraisal guidance no. 170 April 2009.
- Rivaroxaban (Xarelto®) 10mg film-coated tablets. Summary of Product Characteristics. Bayer plc. (Last revision of text November 2013).
- Cockcroft DW, Gault MH. (1976) Prediction of creatinine clearance from serum creatinine. *Nephron*; **16**: 31–41.

Appendix 1 : Treatment guidelines

Risk assessment chart — Trauma

Trauma injury	Treatment guidelines		
	Low risk	**Moderate risk**	**High risk**
HIP FRACTURE	Enoxaparin 20mg nocte commencing night of admission and continuing until post-operation, at that point increasing to 40mg* nocte for 28 days. If admitted on aspirin and/or clopidogrel, consider mechanical pneumatic compression device and consider postponing commencement of enoxaparin until post-operation	Enoxaparin 20mg nocte commencing night of admission and continuing until post-operation, at that point increasing to 40mg* nocte for 28 days. If admitted on aspirin and/or clopidogrel, consider mechanical pneumatic compression device and consider postponing commencement of enoxaparin until post-operation	Enoxaparin 20mg nocte commencing night of admission and continuing until post-operation, at that point increasing to 40mg* nocte for 28 days. If admitted on aspirin and/or clopidogrel, consider mechanical pneumatic compression device and consider postponing commencement of enoxaparin until post-operation
FEMORAL/TIBIAL FRACTURES & ANKLE FRACTURES	Enoxaparin 20mg nocte commencing night of admission and continuing until post-operation, at that point increasing to 40mg* nocte until discharge. If admitted on aspirin and/or clopidogrel, consider mechanical pneumatic compression device and consider postponing commencement of enoxaparin until post-operation	Enoxaparin 20mg nocte commencing night of admission and continuing until post-operation, at that point increasing to 40mg* nocte until discharge. If admitted on aspirin and/or clopidogrel, consider mechanical pneumatic compression device and consider postponing commencement of enoxaparin until post-operation	Enoxaparin 20mg nocte commencing night of admission and continuing until post-operation, at that point increasing to 40mg* nocte until discharge. If admitted on aspirin and/or clopidogrel, consider mechanical pneumatic compression device and consider postponing commencement of enoxaparin until post-operation
CALCANEAL / FOOT FRACTURES	Elevation & foot pumps.	Elevation & foot pumps.	Elevation & foot pumps. Consideration for enoxaparin after consultant opinion
PELVIC FRACTURES OSTEOPOROTIC LOW VELOCITY (HAEMODYNAMICALLY STABLE)	Early mobilisation Appropriate hydration Mechanical pneumatic compression device	Enoxaparin 20mg nocte Early mobilisation Appropriate hydration If admitted on aspirin and/or clopidogrel, consider mechanical pneumatic compression device and consider postponing commencement of enoxaparin until senior review	Enoxaparin 40mg * nocte Early mobilisation Appropriate hydration If admitted on aspirin and/or clopidogrel, consider mechanical pneumatic compression device and consider postponing commencement of enoxaparin until senior review

*Caution: if estimated creatinine clearance is <30ml/min, enoxaparin dosage should be 20mg nocte

PELVIC FRACTURES HIGH VELOCITY (INCLUDING MULTIPLE INJURIES)	Foot pumps (if injuries permit). Consider enoxaparin 20mg at 72 hours if haemodynamically stable, clotting stable and not undergoing pelvic reconstructive surgery. If undergoing pelvic reconstructive surgery continue foot pumps until post-operatively (post-operative regime to be decided by Mr Kaye). If admitted on aspirin and/or clopidogrel consider postponing commencement of enoxaparin until senior review	Foot pumps (if injuries permit). Consider enoxaparin 20mg at 72 hours if haemodynamically stable, clotting stable and not undergoing pelvic reconstructive surgery. If undergoing pelvic reconstructive surgery continue foot pumps until post-operatively (post-operative regime to be decided by Mr Kaye). If admitted on aspirin and/or clopidogrel consider postponing commencement of enoxaparin until senior review	Foot pumps (if injuries permit). Consider enoxaparin 40mg* at 72 hours if haemodynamically stable, clotting stable and not undergoing pelvic reconstructive surgery. If undergoing pelvic reconstructive surgery continue foot pumps until post-operatively (post-operative regime to be decided by Mr Kaye). If admitted on aspirin and/or clopidogrel consider postponing commencement of enoxaparin until senior review
SPINAL FRACTURES OSTEOPORTIC LOW VELOCITY	Early mobilisation Appropriate hydration	Enoxaparin 20mg nocte Early mobilisation Appropriate hydration	Enoxaparin 40mg * nocte Early mobilisation Appropriate hydration
SPINAL FRACTURES HIGH VELOCITY	Anti-embolism stockings and foot pumps until mobile	Anti-embolism stockings and foot pumps for the first 48 hours, converting to Enoxaparin 20mg nocte if non-mobile at this point.	Anti-embolism stockings and foot pumps for the first 48 hours, converting to Enoxaparin 40mg* nocte if non-mobile at this point.
UPPER LIMB FRACTURES	Early mobilisation Appropriate hydration	Enoxaparin 20mg nocte Early mobilisation, Appropriate hydration	Enoxaparin 40mg* nocte Early mobilisation Appropriate hydration
SOFT TISSUE INFECTIONS / TRAUMA	Early mobilisation Appropriate hydration	Enoxaparin 20mg nocte Early mobilisation Appropriate hydration	Enoxaparin 40mg* nocte Early mobilisation Appropriate hydration

*Caution: if estimated creatinine clearance is <30ml/min, enoxaparin dosage should be 20mg nocte

Risk Assessment Chart - Elective

Elective Procedure	Treatment Guidelines		
	Low Risk	**Moderate Risk**	**High Risk**
TOTAL HIP REPLACEMENT / HIP RESURFACING	RIVAROXABAN orally once daily for all risk categories 10mg once daily for 35 days. The initial dose should be taken 6 to 10 hours after completed surgery. **Severe renal impairment (CrCl <15ml/min):** **Rivaroxaban is contraindicated** If VTE prophylaxis is required, use **enoxaparin** 20mg nocte **Hepatic Impairment** **Rivaroxaban is contraindicated in patients with hepatic disease associated with coagulopathy and clinically relevant bleeding risk** including cirrhotic patients with Child Pugh B and C. Appendix 3 specifies how this will be phrased on the electronic VTE assessment		
TOTAL KNEE REPLACEMENT / UNICOMPARTMENTAL REPLACEMENT	RIVAROXABAN orally once daily for all risk categories 10mg once daily for 14 days. The initial dose should be taken 6 to 10 hours after completed surgery. **Severe renal impairment (CrCl <15ml/min):** **Rivaroxaban is contraindicated** If VTE prophylaxis is required, use **enoxaparin** 20mg nocte **Hepatic Impairment** **Rivaroxaban is contraindicated in patients with hepatic disease associated with coagulopathy and clinically relevant bleeding risk** including cirrhotic patients with Child Pugh B and C. Appendix 3 specifies how this will be phrased on the electronic VTE assessment		

*Caution: if estimated creatinine clearance is <30ml/min, enoxaparin dosage should be 20mg nocte

REVISION HIP REPLACEMENT / REVISION KNEE REPLACEMENT	High risk VTE procedure. Thromboprophylaxis regime to be agreed with consultant.	High risk VTE procedure. Thromboprophylaxis regime to be agreed with consultant.	High risk VTE procedure. Thromboprophylaxis regime to be agreed with consultant.
HIP ARTHROSCOPY	Early mobilisation Appropriate hydration	Enoxaparin 20mg nocte Early mobilisation Appropriate hydration	Enoxaparin 40mg* nocte Early mobilisation Appropriate hydration
KNEE ARTHROSCOPY	Early mobilisation Appropriate hydration	Enoxaparin 20mg nocte Early mobilisation Appropriate hydration For Day case procedures that warrant enoxaparin therapy this is to be prescribed perioperatively at the consultant's discretion	Enoxaparin 40mg* nocte Early mobilisation Appropriate hydration For Day case procedures which warrant enoxaparin therapy this is to be prescribed perioperatively at the consultant's discretion
ANKLE ARTHROSCOPY	Early mobilisation Appropriate hydration	Enoxaparin 20mg nocte Early mobilisation Appropriate hydration	Enoxaparin 40mg* nocte Early mobilisation Appropriate hydration
ACL or PCL RECONSTRUCTION	Early mobilisation Appropriate hydration	Enoxaparin 20mg nocte Early mobilisation Appropriate hydration	Enoxaparin 40mg* nocte Early mobilisation Appropriate hydration
ANKLE / FOOT SURGERY	Appropriate hydration Mobilisation as appropriate to surgery Where Aspirin is to be prescribed this will be specified in the operation note	Appropriate hydration Mobilisation as appropriate to surgery If enoxaparin or Aspirin is required dosage & length of treatment will be specified in operation note	Appropriate hydration Mobilisation as appropriate to surgery If enoxaparin or Aspirin is required dosage & length of treatment will be specified in operation note
UPPER LIMB SURGERY	Early mobilisation Appropriate hydration	Enoxaparin 20mg nocte Early mobilisation Appropriate hydration	Enoxaparin 40mg* nocte Early mobilisation Appropriate hydration

*Caution: if estimated creatinine clearance is <30ml/min, enoxaparin dosage should be 20mg nocte

JOINT INJECTION UNDER GENERAL ANAESTHETIC	Early mobilisation Appropriate hydration	Enoxaparin 20mg nocte Early mobilisation Appropriate hydration For Day case procedures that warrant enoxaparin therapy this is to be prescribed perioperatively at the consultant's discretion	Enoxaparin 20 to 40mg* to be commenced by Consultant peri-operatively Early mobilisation Appropriate hydration For Day case procedures that warrant enoxaparin therapy, this is to be prescribed perioperatively at the consultant's discretion

*Caution: if estimated creatinine clearance is <30ml/min, enoxaparin dosage should be 20mg nocte

Appendix 2: Calculating renal function

Cockcroft and Gault Equation for Creatinine Clearance:

$$\text{Creatinine clearance (mL/min)} = \frac{Y \times (140 - \text{age}) \times \text{ideal body weight*}}{\text{Serum Creatinine umol/L}}$$

Where Y = 1.23 for males and 1.04 for females

Ideal body weight (females) = [45.5kg + (2.3 X every inch over 5ft)] kg
Ideal body weight (males) = [50kg + (2.3 X every inch over 5ft)] kg

*If patient underweight use actual body weight

Appendix 3: Phrasing of advice on electronic VTE assessment for total hip or knee replacements

Rivaroxaban orally once daily as per electronic prescribing pathway.

Severe renal impairment (CrCl <15ml/min):
RIVAROXABAN IS CONTRAINDICATED – consider enoxaparin

If decision is to prescribe enoxaparin then dose as follows:
Enoxaparin 20mg nocte

Hepatic Impairment
RIVAROXABAN IS CONTRAINDICATED in patients with hepatic disease associated with coagulopathy and clinically relevant bleeding risk including cirrhotic patients with Child Pugh B and C.

Prescriber to review and prescribe as appropriate.