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 Thrombophilies / Hypercoagulation state  
4pts  
(eg, Protein C or S or AT III deficiency, Factor V Leiden, Lupus anticoagulant, Prothrombin gene mutation)

e) Obesity (BMI > 30 kg/m^2)  
1pt

f) One or more significant medical comorbidities  
1pt  
(eg, Heart Disease, metabolic, endocrine or respiratory pathologies, acute infectious diseases, inflammatory conditions)

g) Previous personal history of DVT/PE (requiring warfarinisation)  
4pts  
< 5yrs ago

h) Previous personal history of DVT/PE (requiring warfarinisation)  
3pts  
> 5yrs ago or first degree relative with a history of DVT/PE

h) Varicose veins with phlebitis  
1pts

i) Significantly reduced mobility for 3 days or more  
2pts

j) Acute surgical admission with inflammatory or  
1pt  
Intra-abdominal condition

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  
Not part of scoring  
(see NICE guidance for specific risk factors)

Risk category calculated by electronic VTE assessment pathway

<table>
<thead>
<tr>
<th>Risk Category</th>
<th>0–2</th>
<th>3</th>
<th>4 or More</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MODERATE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIGH</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Venothromboembolism prophylaxis: Trauma and Orthopaedics — Clinical guideline, V2a
Update approved by Wirral Drug & Therapeutics Committee: April 2013

Principal author: Nigel Donnachie
Review date: May 2014
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**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 tinzaparin or apixaban 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 tinzaparin therapy after the first stage, followed by tinzaparin **OR** apixaban after the second stage (unless contraindicated). The exact regimen needs to be agreed perioperatively by the surgical team.

**Extended duration tinzaparin treatment**
Hip fracture patients who have extended tinzaparin 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 tinzaparin or apixaban 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).
- Apixaban for the prevention of venous thromboembolism after total hip or knee replacement in adults. NICE Technology Appraisal guidance no. 245 January 2012.
- Apixaban (Eliquis®) 2.5mg tablets. Summary of Product Characteristics. Bristol-Myers Squibb-Pfizer (Revised on 12 February 2013).
## Risk assessment chart — Trauma

<table>
<thead>
<tr>
<th>Trauma injury</th>
<th>Low risk</th>
<th>Moderate risk</th>
<th>High risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIP FRACTURE</td>
<td>Tinzaparin 3,500units* nocte commencing night of admission and continuing until post-operation, at that point increasing to 4,500units* nocte until discharge.</td>
<td>Tinzaparin 3,500units* nocte commencing night of admission and continuing until post-operation, at that point increasing to 4,500units* nocte until discharge.</td>
<td>Tinzaparin 3,500units* nocte commencing night of admission and continuing until post-operation, at that point increasing to 4,500units* nocte until discharge.</td>
</tr>
<tr>
<td></td>
<td>If admitted on aspirin and/or clopidogrel, consider mechanical pneumatic compression device and consider postponing commencement of tinzaparin until post-operation</td>
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</tr>
<tr>
<td>FEMORAL/TIBIAL FRACTURES &amp; ANKLE FRACTURES</td>
<td>Tinzaparin 3,500units* nocte commencing night of admission and continuing until post-operation, at that point increasing to 4,500units* nocte until discharge.</td>
<td>Tinzaparin 3,500units* nocte commencing night of admission and continuing until post-operation, at that point increasing to 4,500units* nocte until discharge.</td>
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</tr>
<tr>
<td>CALCANEAL / FOOT FRACTURES</td>
<td>Elevation &amp; foot pumps.</td>
<td>Elevation &amp; foot pumps.</td>
<td>Elevation &amp; foot pumps. Consideration for Tinzaparin after consultant opinion</td>
</tr>
<tr>
<td>PELVIC/FRACTURES OSTEOPOROTIC LOW VELOCITY (HAEMODYNAMICALLY STABLE)</td>
<td>Early mobilisation Appropriate hydration Mechanical pneumatic compression device</td>
<td>Tinzaparin 3,500units* nocte Early mobilisation Appropriate hydration</td>
<td>Tinzaparin 4,500units* nocte Early mobilisation Appropriate hydration</td>
</tr>
</tbody>
</table>

*Caution: if estimated creatinine clearance is <20mLmin, tinzaparin dosage should be as follows:
- If patient weighs **MORE THAN** 70kg: Tinzaparin 3,500units nocte
- If patient weighs **LESS THAN** 70kg: Tinzaparin 2,500units nocte
<table>
<thead>
<tr>
<th>Fracture Type</th>
<th>Prophylaxis Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pelvic Fractures (Including Multiple Injuries)</td>
<td>Foot pumps (if injuries permit). Consider Tinzaparin 3,500units* 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 tinzaparin until senior review.</td>
</tr>
<tr>
<td>Spinal Fractures (Osteoporotic Low Velocity)</td>
<td>Early mobilisation, Appropriate hydration, Tinzaparin 3,500units* nocte.</td>
</tr>
<tr>
<td>Spinal Fractures (High Velocity)</td>
<td>Anti-embolism stockings and foot pumps until mobile. Anti-embolism stockings and foot pumps for the first 48 hours, converting to Tinzaparin 3,500units* nocte if non-mobile at this point.</td>
</tr>
<tr>
<td>Upper Limb FRACTURES</td>
<td>Early mobilisation, Appropriate hydration, Tinzaparin 3,500units* nocte.</td>
</tr>
<tr>
<td>Soft Tissue Infections / Trauma</td>
<td>Early mobilisation, Appropriate hydration, Tinzaparin 3,500units* nocte.</td>
</tr>
</tbody>
</table>

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- If patient weighs **MORE THAN** 70kg: Tinzaparin 3,500units nocte
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### Risk Assessment Chart - Elective

<table>
<thead>
<tr>
<th>Elective Procedure</th>
<th>Treatment Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TOTAL HIP REPLACEMENT / HIP RESURFACING</strong></td>
<td>APIXABAN orally twice daily for all risk categories</td>
</tr>
<tr>
<td></td>
<td>2.5mg twice daily for 32 days. The initial dose should be taken 12 to 24 hours after completed surgery.</td>
</tr>
<tr>
<td><strong>Severe renal impairment (CrCl &lt;15ml/min):</strong></td>
<td><strong>APIXABAN IS CONTRAINDICATED</strong></td>
</tr>
<tr>
<td></td>
<td>If VTE prophylaxis is required, tinzaparin should be prescribed as follows:</td>
</tr>
<tr>
<td></td>
<td>• Tinzaparin 3500units nocte (if patient weighs &gt;70kg) or 2500units nocte (if patient weighs &lt;70kg)</td>
</tr>
<tr>
<td><strong>Hepatic Impairment</strong></td>
<td>APIxaban is contraindicated in patients with hepatic disease associated with coagulopathy and clinically relevant bleeding risk. Use with caution in patients with elevated liver enzymes ALT/AST &gt; 2 x upper limit of normal(ULN) or total bilirubin ≥ 1.5 x ULN.</td>
</tr>
<tr>
<td></td>
<td>Appendix 3 specifies how this will be phrased on the electronic VTE assessment</td>
</tr>
<tr>
<td><strong>TOTAL KNEE REPLACEMENT / UNICOMPARTMENTAL REPLACEMENT</strong></td>
<td>APIXABAN orally twice daily for all risk categories</td>
</tr>
<tr>
<td></td>
<td>2.5mg twice daily for 10 days. The initial dose should be taken 12 to 24 hours after completed surgery.</td>
</tr>
<tr>
<td><strong>Severe renal impairment (CrCl &lt;15ml/min):</strong></td>
<td><strong>APIXABAN IS CONTRAINDICATED</strong></td>
</tr>
<tr>
<td></td>
<td>If VTE prophylaxis is required, tinzaparin should be prescribed as follows:</td>
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</tr>
<tr>
<td></td>
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</table>

*Caution: if estimated creatinine clearance is <20mL/min, tinzaparin dosage should be as follows:*

- If patient weighs **MORE THAN** 70kg: Tinzaparin 3,500units nocte
- If patient weighs **LESS THAN** 70kg: Tinzaparin 2,500units nocte
<table>
<thead>
<tr>
<th>Procedure</th>
<th>Thromboprophylaxis Regime</th>
<th>Dosage</th>
<th>Regime to be Agreed</th>
</tr>
</thead>
<tbody>
<tr>
<td>REVISION HIP REPLACEMENT / REVISION KNEE REPLACEMENT</td>
<td>High risk VTE procedure. Thromboprophylaxis regime to be agreed with consultant.</td>
<td>High risk VTE procedure. Thromboprophylaxis regime to be agreed with consultant.</td>
<td>High risk VTE procedure. Thromboprophylaxis regime to be agreed with consultant.</td>
</tr>
<tr>
<td>HIP ARTHROSCOPY</td>
<td>Early mobilisation</td>
<td>Tinzaparin 3,500units* noyte Early mobilisation Appropriate hydration</td>
<td>Tinzaparin 4,500units* noyte Early mobilisation Appropriate hydration</td>
</tr>
<tr>
<td>KNEE ARTHROSCOPY</td>
<td>Early mobilisation</td>
<td>Tinzaparin 3,500units* noyte Early mobilisation Appropriate hydration For Day case procedures which warrant Tinzaparin therapy this is to be prescribed perioperatively at the consultant’s discretion</td>
<td>Tinzaparin 4,500units* noyte Early mobilisation Appropriate hydration For Day case procedures which warrant Tinzaparin therapy this is to be prescribed perioperatively at the consultant’s discretion</td>
</tr>
<tr>
<td>ANKLE ARTHROSCOPY</td>
<td>Early mobilisation</td>
<td>Tinzaparin 3,500units* noyte Early mobilisation Appropriate hydration</td>
<td>Tinzaparin 4,500units* noyte Early mobilisation Appropriate hydration</td>
</tr>
<tr>
<td>ACL or PCL RECONSTRUCTION</td>
<td>Early mobilisation</td>
<td>Tinzaparin 3,500units* noyte Early mobilisation Appropriate hydration</td>
<td>Tinzaparin 4,500units* noyte Early mobilisation Appropriate hydration</td>
</tr>
<tr>
<td>ANKLE / FOOT SURGERY</td>
<td>Appropriate hydration</td>
<td>Tinzaparin 3,500units* noyte Early mobilisation Appropriate hydration</td>
<td>Tinzaparin 4,500units* noyte Early mobilisation Appropriate hydration</td>
</tr>
<tr>
<td>UPPER LIMB SURGERY</td>
<td>Early mobilisation</td>
<td>Tinzaparin 3,500units* noyte Early mobilisation Appropriate hydration</td>
<td>Tinzaparin 4,500units* noyte Early mobilisation Appropriate hydration</td>
</tr>
</tbody>
</table>

*Caution: if estimated creatinine clearance is <20mL/min, tinzaparin dosage should be as follows:
- If patient weighs MORE THAN 70kg: Tinzaparin 3,500units noyte
- If patient weighs LESS THAN 70kg: Tinzaparin 2,500units noyte
**Caution:** if estimated creatinine clearance is <20mL/min, tinzaparin dosage should be as follows:

- If patient weighs **MORE THAN** 70kg: Tinzaparin 3,500units nocte
- If patient weighs **LESS THAN** 70kg: Tinzaparin 2,500units nocte

<table>
<thead>
<tr>
<th>JOINT INJECTION UNDER GENERAL ANAESTHETIC</th>
<th>Early mobilisation</th>
<th>Tinzaparin 3,500units* nocte</th>
<th>For Day case procedures which warrant Tinzaparin therapy this is to be prescribed perioperatively at the consultant’s discretion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Appropriate hydration</td>
<td>Early mobilisation</td>
<td>Appropriate hydration</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tinzaparin 3,500-4,500units* to be commenced by Consultant peri-operatively Early mobilisation Appropriate hydration</td>
<td>For Day case procedures which warrant Tinzaparin therapy this is to be prescribed perioperatively at the consultant’s discretion</td>
</tr>
</tbody>
</table>
Appendix 2: Calculating renal function

Cockcroft and Gault Equation for Creatinine Clearance:

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

Where \( Y = 1.23 \) for males and \( 1.04 \) for females

Ideal body weight (females) = \([45.5\text{kg} + (2.3 \times \text{every inch over 5ft})]\) kg
Ideal body weight (males) = \([50\text{kg} + (2.3 \times \text{every inch over 5ft})]\) kg

*If patient underweight use actual body weight
Appendix 3: Phrasing of advice on electronic VTE assessment for total hip or knee replacements

Apixaban orally twice daily as per PCIS prescribing pathway.

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

If decision is to prescribe Tinzaparin then dose as follows:
Tinzaparin 3,500units (>70kg) or 2,500units (<70kg) nocte

Hepatic Impairment
Apixaban is contraindicated in patients with hepatic disease associated with coagulopathy and clinically relevant bleeding risk.
Use with caution in patients with elevated liver enzymes ALT/AST > 2 x upper limit of normal (ULN) or total bilirubin ≥ 1.5 x ULN.

Prescriber to review and prescribe as appropriate.