Thromboprophylaxis after surgery

FRANCES AKINWUNMI AND SHARRON MILLEN

Hospital–acquired venous thromboembolism is a major public health concern, particularly in surgical patients. Risk assessment followed by appropriate mechanical or pharmacological prophylaxis will substantially reduce the considerable mortality and morbidity related to this condition.

Venous thromboembolism (VTE), comprising deep vein thrombosis (DVT) and pulmonary embolism (PE), is a significant cause of death and morbidity in the UK. Between 25 000 and 32 000 deaths per annum are attributed to hospital-acquired VTE (defined as any VTE within 90 days of hospital discharge). This is more than the total combined deaths per year from breast cancer, AIDS and road traffic accidents, and more than 25 times the number who die from methicillin-resistant Staphylococcus aureus (MRSA).¹

A significant proportion of these deaths occur in surgical patients. VTE is 10–100 times more frequent in surgical than in medical patients and may complicate 5–28 per cent of operations.² The primary cause of VTE-related death is PE, which is attributed to 6.4 per cent of surgery-related deaths.²

Even when non-fatal, VTE can cause substantial long-term morbidity. The development of post-thrombotic syndrome occurs in 20–50 per cent of patients following DVT and results in chronic painful leg swelling and an additional burden of ill health.³
Recognition of the scale of the problem has placed hospital-acquired VTE on the government agenda as a major public health concern. Embedding VTE within the NHS operating framework and clinical quality indicators requires trusts to address the challenges and resolve the practicalities of delivering best practice.

Reducing the incidence of hospital-related VTE is the responsibility of the whole multidisciplinary team across both primary and secondary care.

RISK ASSESSMENT
Box 1 outlines surgical admission and patient risk factors for VTE and bleeding, which must be assessed and balanced on admission and reassessed within 24 hours of admission and whenever the patient’s clinical situation changes to ensure appropriate thromboprophylaxis and to identify any adverse effects. Urology inpatients are more likely to be older and to have comorbidities and/or malignancy, and therefore an increased VTE risk. Box 2 outlines some examples of factors in urological surgery that may impact on patients’ VTE and bleeding risk.

PROPHYLAXIS
All patients should be encouraged to mobilise as appropriate. Adequate fluid intake is encouraged.

Mechanical thromboprophylaxis
The National Institute for Health and Clinical Excellence (NICE) recommends that most patients at risk of VTE should receive mechanical thromboprophylaxis. This reduces venous stasis of blood in patients with reduced mobility, preventing pooling of blood and the propagation of microthrombi. Mechanical thromboprophylaxis is not as effective as pharmacological methods, but is not associated with the increased risk of bleeding that pharmacological methods pose.

Antiembolism stockings are efficacious when an evidence-based brand is used and they are measured and fitted correctly. Patients should be advised to wear stockings continuously during the period of impaired immobility, with daily removal for hygiene purposes, to check skin integrity and to exercise feet and toes.

All patients admitted to hospital must have a documented VTE risk assessment that incorporates an assessment and balancing of the patient’s risks of thrombosis and bleeding. Risk assessment is then followed by appropriate thromboprophylaxis. It is believed that employing this approach will substantially reduce VTE-related mortality, the majority of which is preventable.

**BOX 1. Surgical admission and patient risk factors for venous thromboembolism (VTE) and bleeding**

**SURGICAL ADMISSION FACTORS**

**Risk factors for VTE**
- Total anaesthetic + surgical time >90 minutes
- Surgery involving pelvis or lower limb and total anaesthetic + surgical time >60 minutes
- Acute surgical admission with inflammatory or intra-abdominal condition
- Surgery with significant reduction in mobility
- Hip or knee replacement
- Hip fracture
- Bariatric surgery
- Critical care admission

**Risk factors for bleeding**
- Lumbar puncture, epidural or spinal anaesthesia within the previous 4 hours or expected within the next 12 hours
- Neurosurgery, spinal surgery or eye surgery

**PATIENT FACTORS**

**Risk factors for VTE**
- Active cancer or cancer treatment
- Age >60 years
- Dehydration
- Known thrombophilia
- Obesity (BMI >30kg/m²)
- One or more medical comorbidities (e.g., heart disease; metabolic, endocrine or respiratory pathologies; acute infectious diseases; inflammatory conditions)
- Personal history or first-degree relative with history of VTE
- Varicose veins with phlebitis

**Risk factors for bleeding**
- Active bleeding
- Acquired bleeding disorder such as acute liver failure
- Acute stroke
- Thrombocytopenia
- Uncontrolled systolic hypertension (≥230/120mmHg)
- Untreated inherited bleeding disorder such as haemophilia or von Willebrand’s disease
Contraindications to use include conditions associated with poor arterial perfusion, fluid overload, skin disorders and leg deformities. Other mechanical methods include intermittent pneumatic compression devices (IPCD) and foot impulse devices (FID).

Consideration must be given to the practicalities of mechanical methods. Antiembolism stockings are not recommended for hip/knee replacement or hip fracture because of difficulties of use. Instead, IPCD or FID may be more appropriate. Mechanical VTE prophylaxis should be continued until the patient no longer has significantly reduced mobility.

Pharmacological prophylaxis
In practice we observe that concerns around increased risks of postoperative bleeding in patients on pharmacological prophylaxis linked with under-reported rates of symptomatic post-surgery PE may contribute to underprescribing of pharmacological thromboprophylaxis. However, the rationale for thromboprophylaxis is sound, with clear data demonstrating increased VTE morbidity and mortality post-surgery; and the efficacy and cost-effectiveness of thromboprophylaxis in reducing DVT and PE.

The following parenteral thromboprophylaxis agents are advocated in NICE guidance:6

- unfractionated heparin (UFH)
- low molecular weight heparin (LMWH)
- fondaparinux.

They all work by potentiating antithrombin (naturally occurring anticoagulant) and consequently inhibiting the clotting factors thrombin and factor Xa to varying degrees (note: fondaparinux only inhibits factor Xa). UFH is generally reserved for patients in renal failure (creatinine clearance <30ml/min) or those at high risk of bleeding. Its use is limited by its short half-life, monitoring requirements and risk of heparin-induced thrombocytopenia (HIT). For most patients, LMWHs are the agents of choice, with a stable pharmacokinetic profile, reduced monitoring requirements, reduced occurrence of HIT relative to UFH, as well as demonstrated cost-effectiveness. Because of its increased price, fondaparinux is often reserved for use in LMWH-associated HIT.

In addition, NICE advocates the use of two newer oral anticoagulants, dabigatran (direct thrombin inhibitor) and rivaroxaban (factor Xa inhibitor), which do not require coagulation monitoring. These agents present additional options for thromboprophylaxis within their licensed indications (following hip and knee replacement surgery). One advantage of the newer oral agents over parenteral agents is ease of administration; this is of particular relevance for extended prophylaxis post-discharge.

Other agents not covered by NICE include danaparinoid, a parenteral specific indirect inhibitor of factor Xa. Danaparinoid has a role in the management of complex renal patients who have previously had HIT.

Antiplatelet agents are inadequate prophylaxis for VTE but form an important part of the bleeding risk assessment.

WHEN TO START THROMBOPROPHYLAXIS
The question of when to start post-surgical thromboprophylaxis depends predominantly on the patient’s haemostatic status and relative bleeding risk. Patients who have a low bleeding risk generally start thromboprophylaxis within 6–12 hours of surgery, while it may be delayed until 48 hours post-surgery in patients at high risk of bleeding.

The oral agents can be commenced soon after hip/knee replacement surgery (dabigatran 1–4 hours and rivaroxaban 6–10 hours post-surgery). However, in some centres the start of these newer agents is delayed to 24 hours following surgery to reduce risk of site bleeding. The dose of agent may be altered to take into account factors such as the patient’s age,
DURATION OF THROMBOPROPHYLAXIS

Data on the optimum duration of post-surgical thromboprophylaxis are not definitive. Treatment for low-risk non-orthopaedic surgery should generally continue for five to seven days and until mobility is no longer substantially reduced. Recognition of the prolonged and increased VTE risk, particularly in high VTE risk surgery, has led to the duration of thromboprophylaxis being extended (Table 2, see page 18). It is therefore important to ensure arrangements have been made ahead of patients’ discharge to support them in this transition and assess their ability to self-administer their medication.

MONITORING PATIENTS ON THROMBOPROPHYLAXIS

Before commencing thromboprophylaxis, baseline full blood count, urea and electrolytes, liver function tests, platelet count and clotting screen should be taken. For heparins, regular platelet counts are required to detect and manage HIT as appropriate. HIT is characterised by a greater than 30 per cent reduction in platelet count and/or new thrombosis or skin allergy typically between days 5 and 14 of treatment. When a diagnosis of HIT is confirmed or highly probable, heparins should be stopped and ongoing treatment discussed with haematology colleagues. In addition, patients predisposed to hyperkalaemia may require monitoring of their potassium levels.

CONCLUSION

Venous thromboembolism is a major cause of morbidity and mortality in the UK, with surgical patients being among those at highest risk. Recognition of the incidence and preventability of this condition has put hospital-acquired VTE high on the government’s agenda as a public health concern. At the local level, healthcare professionals should work together to ensure all patients are risk-assessed and that appropriate mechanical and pharmacological thromboprophylaxis is provided. In addition, with the increasing acceptance of extended prophylaxis, systems need to be in place across secondary and primary care to support adequate thromboprophylaxis of patients post-discharge.

DECLARATION OF INTERESTS

Frances Akinwunmi has attended an advisory board hosted by Boehringer Ingelheim. Sharron Millen has completed consultancy work for Boehringer Ingelheim, Sanofi Aventis, Bayer and Pfizer.

REFERENCES


2. Lubin MF. Medical management of the surgical patient: a textbook of perioperative medicine, 4th edn. In:
<table>
<thead>
<tr>
<th>Surgery type</th>
<th>Recommended thromboprophylaxis when risk of VTE outweighs risk of bleeding</th>
<th>Duration of thromboprophylaxis</th>
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</thead>
<tbody>
<tr>
<td>Non-orthopaedic surgery</td>
<td>LMWH (or UFH)</td>
<td>Continue until mobility is no longer significantly reduced – approximately 5–7 days</td>
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<tr>
<td>Cardiac</td>
<td></td>
<td>If the patient has had major cancer surgery in the abdomen or pelvis, continue for 28 days after surgery</td>
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<tr>
<td>Urological</td>
<td>LMWH, fondaparinux (or UFH)</td>
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<tr>
<td>Neurological</td>
<td>LMWH, fondaparinux (or UFH)</td>
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<td>Vascular</td>
<td>LMWH, fondaparinux (or UFH)</td>
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<td>Gastrointestinal day surgery</td>
<td>LMWH, fondaparinux (or UFH)</td>
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<tr>
<td>Orthopaedic surgery</td>
<td>LMWH, fondaparinux (or UFH), rivaroxaban or dabigatran</td>
<td>28–35 days after hip replacement 10–14 days after knee replacement</td>
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<td>Hip replacement</td>
<td>LMWH, fondaparinux (or UFH)</td>
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<td>Knee replacement</td>
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<tr>
<td>Hip fracture</td>
<td>LMWH, fondaparinux (or UFH)</td>
<td>Continue for 28–35 days</td>
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<tr>
<td>Other</td>
<td>LMWH (or UFH)</td>
<td>Continue until mobility is no longer significantly reduced</td>
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<td>LMWH, low molecular weight heparin; UFH, unfractionated heparin; VTE, venous thromboembolism.</td>
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Table 2. Post-surgery pharmacological thromboprophylaxis


