

Issue date: January 2010

## **Venous thromboembolism: reducing the risk**

**Reducing the risk of venous  
thromboembolism (deep vein thrombosis  
and pulmonary embolism) in patients  
admitted to hospital**

**This guideline updates NICE clinical  
guideline 46 and replaces it**

**NICE clinical guideline 92**  
**Reducing the risk of venous thromboembolism (deep vein thrombosis and pulmonary embolism) in patients admitted to hospital**

**Ordering information**

You can download the following documents from [www.nice.org.uk/guidance/CG92](http://www.nice.org.uk/guidance/CG92)

- The NICE guideline (this document) – all the recommendations.
- A quick reference guide – a summary of the recommendations for healthcare professionals.
- ‘Understanding NICE guidance’ – a summary for patients and carers.
- The full guideline – all the recommendations, details of how they were developed, and reviews of the evidence they were based on.

For printed copies of the quick reference guide or ‘Understanding NICE guidance’, phone NICE publications on 0845 003 7783 or email [publications@nice.org.uk](mailto:publications@nice.org.uk) and quote:

- N2080 (quick reference guide)
- N2081 (‘Understanding NICE guidance’).

NICE clinical guidelines are recommendations about the treatment and care of people with specific diseases and conditions in the NHS in England and Wales.

This guidance represents the view of NICE, which was arrived at after careful consideration of the evidence available. Healthcare professionals are expected to take it fully into account when exercising their clinical judgement. However, the guidance does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or guardian or carer, and informed by the summary of product characteristics of any drugs they are considering.

Implementation of this guidance is the responsibility of local commissioners and/or providers. Commissioners and providers are reminded that it is their responsibility to implement the guidance, in their local context, in light of their duties to avoid unlawful discrimination and to have regard to promoting equality of opportunity. Nothing in this guidance should be interpreted in a way that would be inconsistent with compliance with those duties.

**National Institute for Health and Clinical Excellence**

MidCity Place  
71 High Holborn  
London WC1V 6NA  
[www.nice.org.uk](http://www.nice.org.uk)

© National Institute for Health and Clinical Excellence, 2010. All rights reserved. This material may be freely reproduced for educational and not-for-profit purposes. No reproduction by or for commercial organisations, or for commercial purposes, is allowed without the express written permission of NICE.

## Contents

Introduction .....	4
Patient-centred care.....	6
Key priorities for implementation.....	7
1 Guidance .....	10
1.1 Assessing the risks of VTE and bleeding.....	10
1.2 Reducing the risk of VTE .....	13
1.3 Using VTE prophylaxis.....	13
1.4 Medical patients.....	16
1.5 Surgical patients .....	20
1.6 Other patient groups .....	30
1.7 Patient information and planning for discharge.....	34
2 Notes on the scope of the guidance .....	36
3 Implementation.....	37
4 Research recommendations.....	38
4.1 Assessing the risk of VTE .....	38
4.2 VTE prophylaxis for medical patients.....	38
4.3 VTE prophylaxis for patients with lower limb plaster casts.....	39
4.4 VTE prophylaxis for patients after stroke .....	40
4.5 Incidence of post-thrombotic syndrome after VTE .....	40
5 Other versions of this guideline .....	41
5.1 Full guideline.....	41
5.2 Quick reference guide.....	41
5.3 'Understanding NICE guidance' .....	41
6 Related NICE guidance .....	41
7 Updating the guideline.....	42
Appendix A: The Guideline Development Group and NICE Project Team.....	43
Appendix B: The Guideline Review Panel .....	49
Appendix C: The algorithms.....	50

This guidance is an update of NICE clinical guideline 46 (published April 2007) and replaces it.

## Introduction

The House of Commons Health Committee<sup>1</sup> reported in 2005 that an estimated 25,000 people in the UK die from preventable hospital-acquired venous thromboembolism (VTE) every year. This includes patients admitted to hospital for medical care and surgery. The inconsistent use of prophylactic measures for VTE in hospital patients has been widely reported. A UK survey suggested that 71% of patients assessed to be at medium or high risk of developing deep vein thrombosis did not receive any form of mechanical or pharmacological VTE prophylaxis<sup>2</sup>.

VTE is a condition in which a blood clot (thrombus) forms in a vein. It most commonly occurs in the deep veins of the legs; this is called deep vein thrombosis. The thrombus may dislodge from its site of origin to travel in the blood – a phenomenon called embolism.

VTE encompasses a range of clinical presentations. Venous thrombosis is often asymptomatic; less frequently it causes pain and swelling in the leg. Part or all of the thrombus can come free and travel to the lung as a potentially fatal pulmonary embolism. Symptomatic venous thrombosis carries a considerable burden of morbidity, including long-term morbidity because of chronic venous insufficiency. This in turn can cause venous ulceration and development of a post-thrombotic limb (characterised by chronic pain, swelling and skin changes).

VTE is an important cause of death in hospital patients, and treatment of non-fatal symptomatic VTE and related long-term morbidities is associated with considerable cost to the health service.

---

<sup>1</sup>House of Commons Health Committee (2005) The prevention of venous thromboembolism in hospitalised patients. London: The Stationery Office.

<sup>2</sup>Rashid ST, Thursz MR, Razvi NA et al. (2005) Venous thromboprophylaxis in UK medical inpatients. *Journal of the Royal Society of Medicine* 98 (11): 507–12.

The risk of developing VTE depends on the condition and/or procedure for which the patient is admitted and on any predisposing risk factors (such as age, obesity and concomitant conditions).

This guideline makes recommendations on assessing and reducing the risk of VTE in patients in hospital. It offers guidance on the most clinically and cost-effective measures for VTE prophylaxis in these patients. The recommendations take into account the potential risks of the various options for prophylaxis and patient preferences.

The guideline assumes that prescribers will use a drug's summary of product characteristics to inform decisions made with individual patients.

## **Patient-centred care**

This guideline offers best practice advice on reducing the risk of VTE in patients admitted to hospital.

Treatment and care should take into account patients' needs and preferences. People admitted to hospital should have the opportunity to make informed decisions about their care and treatment, in partnership with their healthcare professionals. If patients do not have the capacity to make decisions, healthcare professionals should follow the Department of Health's advice on consent (available from [www.dh.gov.uk/consent](http://www.dh.gov.uk/consent)) and the code of practice that accompanies the Mental Capacity Act (summary available from [www.publicguardian.gov.uk](http://www.publicguardian.gov.uk)). In Wales, healthcare professionals should follow advice on consent from the Welsh Assembly Government (available from [www.wales.nhs.uk/consent](http://www.wales.nhs.uk/consent)).

Good communication between healthcare professionals and patients is essential. It should be supported by evidence-based written information tailored to the patient's needs. Treatment and care, and the information patients are given about it, should be culturally appropriate. It should also be accessible to people with additional needs such as physical, sensory or learning disabilities, and to people who do not speak or read English.

If the patient agrees, families and carers should have the opportunity to be involved in decisions about treatment and care.

Families and carers should also be given the information and support they need.

## Key priorities for implementation

### Assessing the risks of VTE and bleeding

- Assess all patients on admission to identify those who are at increased risk of VTE. **[1.1.1]**
- Regard medical patients as being at increased risk of VTE if they:
  - have had or are expected to have significantly reduced mobility for 3 days or more **or**
  - are expected to have ongoing reduced mobility relative to their normal state and have one or more of the risk factors shown in [box 1](#). **[1.1.2]**
- Regard surgical patients and patients with trauma as being at increased risk of VTE if they meet one of the following criteria:
  - surgical procedure with a total anaesthetic and surgical time of more than 90 minutes, or 60 minutes if the surgery involves the pelvis or lower limb
  - acute surgical admission with inflammatory or intra-abdominal condition
  - expected significant reduction in mobility
  - one or more of the risk factors shown in [box 1](#). **[1.1.3]**
- Assess all patients for risk of bleeding before offering pharmacological VTE prophylaxis<sup>3</sup>. Do not offer pharmacological VTE prophylaxis to patients with any of the risk factors for bleeding shown in [box 2](#), unless the risk of VTE outweighs the risk of bleeding. **[1.1.4]**
- Reassess patients' risks of bleeding and VTE within 24 hours of admission and whenever the clinical situation changes, to:
  - ensure that the methods of VTE prophylaxis being used are suitable
  - ensure that VTE prophylaxis is being used correctly
  - identify adverse events resulting from VTE prophylaxis. **[1.1.5]**

### Reducing the risk of VTE

- Encourage patients to mobilise as soon as possible. **[1.2.2]**

---

<sup>3</sup>Prescribers should consult the summary of product characteristics for the pharmacological VTE prophylaxis being used or planned for further details.

- Offer pharmacological VTE prophylaxis to general medical patients assessed to be at increased risk of VTE (see section [1.1](#)). Choose any one of:
  - fondaparinux sodium
  - low molecular weight heparin (LMWH)<sup>4</sup>
  - unfractionated heparin (UFH) (for patients with renal failure).

Start pharmacological VTE prophylaxis as soon as possible after risk assessment has been completed. Continue until the patient is no longer at increased risk of VTE. **[1.4.1]**

### **Patient information and planning for discharge**

- Before starting VTE prophylaxis, offer patients and/or their families or carers verbal and written information on:
  - the risks and possible consequences of VTE
  - the importance of VTE prophylaxis and its possible side effects
  - the correct use of VTE prophylaxis (for example, anti-embolism stockings, foot impulse or intermittent pneumatic compression devices)
  - how patients can reduce their risk of VTE (such as keeping well hydrated and, if possible, exercising and becoming more mobile). **[1.7.2]**
- As part of the discharge plan, offer patients and/or their families or carers verbal and written information on:
  - the signs and symptoms of deep vein thrombosis and pulmonary embolism
  - the correct and recommended duration of use of VTE prophylaxis at home (if discharged with prophylaxis)
  - the importance of using VTE prophylaxis correctly and continuing treatment for the recommended duration (if discharged with prophylaxis)

---

<sup>4</sup>At the time of publication (January 2010) some types of LMWH do not have UK marketing authorisation for VTE prophylaxis in medical patients. Prescribers should consult the summary of product characteristics for the individual LMWH. Informed consent for off-label use should be obtained and documented.

- the signs and symptoms of adverse events related to VTE prophylaxis (if discharged with prophylaxis)
- the importance of seeking help and who to contact if they have any problems using the prophylaxis (if discharged with prophylaxis)
- the importance of seeking medical help and who to contact if deep vein thrombosis, pulmonary embolism or another adverse event is suspected.

**[1.7.3]**

# 1 Guidance

The following guidance is based on the best available evidence. The full guideline ([www.nice.org.uk/guidance/CG92](http://www.nice.org.uk/guidance/CG92)) gives details of the methods and the evidence used to develop the guidance.

Throughout this guidance 'significantly reduced mobility' is used to denote patients who are bedbound, unable to walk unaided or likely to spend a substantial proportion of the day in bed or in a chair.

'Major bleeding' refers to a bleeding event that results in one or more of the following:

- death
- a decrease in haemoglobin concentration of 2g/dl or more
- transfusion of 2 or more units of blood
- bleeding into a retroperitoneal, intracranial or intraocular site
- a serious or life-threatening clinical event
- a surgical or medical intervention.

'Renal failure' refers to an estimated glomerular filtration rate (eGFR) of less than 30 ml/min/1.73m<sup>2</sup>.

## 1.1 *Assessing the risks of VTE and bleeding*

1.1.1 Assess all patients on admission to identify those who are at increased risk of VTE.

1.1.2 Regard medical patients as being at increased risk of VTE if they:

- have had or are expected to have significantly reduced mobility for 3 days or more **or**
- are expected to have ongoing reduced mobility relative to their normal state and have one or more of the risk factors shown in [box 1](#).

- 1.1.3 Regard surgical patients and patients with trauma as being at increased risk of VTE if they meet one of the following criteria:
- surgical procedure with a total anaesthetic and surgical time of more than 90 minutes, or 60 minutes if the surgery involves the pelvis or lower limb
  - acute surgical admission with inflammatory or intra-abdominal condition
  - expected significant reduction in mobility
  - one or more of the risk factors shown in [box 1](#).

**Box 1 Risk factors for VTE**

- Active cancer or cancer treatment
- Age over 60 years
- Critical care admission
- Dehydration
- Known thrombophilias
- Obesity (body mass index [BMI] over 30 kg/m<sup>2</sup>)
- One or more significant medical comorbidities (for example: heart disease; metabolic, endocrine or respiratory pathologies; acute infectious diseases; inflammatory conditions)
- Personal history or first-degree relative with a history of VTE
- Use of hormone replacement therapy
- Use of oestrogen-containing contraceptive therapy
- Varicose veins with phlebitis

For women who are pregnant or have given birth within the previous 6 weeks see [recommendations 1.6.4–1.6.6](#).

- 1.1.4 Assess all patients for risk of bleeding before offering pharmacological VTE prophylaxis<sup>5</sup>. Do not offer pharmacological VTE prophylaxis to patients with any of the risk factors for bleeding shown in [box 2](#), unless the risk of VTE outweighs the risk of bleeding.
- 1.1.5 Reassess patients' risks of bleeding and VTE within 24 hours of admission and whenever the clinical situation changes, to:
- ensure that the methods of VTE prophylaxis being used are suitable
  - ensure that VTE prophylaxis is being used correctly
  - identify adverse events resulting from VTE prophylaxis.

#### **Box 2 Risk factors for bleeding**

- Active bleeding
- Acquired bleeding disorders (such as acute liver failure)
- Concurrent use of anticoagulants known to increase the risk of bleeding (such as warfarin with international normalised ratio [INR] higher than 2)
- Lumbar puncture/epidural/spinal anaesthesia expected within the next 12 hours
- Lumbar puncture/epidural/spinal anaesthesia within the previous 4 hours
- Acute stroke
- Thrombocytopenia (platelets less than  $75 \times 10^9/l$ )
- Uncontrolled systolic hypertension (230/120 mmHg or higher)
- Untreated inherited bleeding disorders (such as haemophilia and von Willebrand's disease)

---

<sup>5</sup>Prescribers should consult the summary of product characteristics for the pharmacological VTE prophylaxis being used or planned for further details.

## **1.2 *Reducing the risk of VTE***

- 1.2.1 Do not allow patients to become dehydrated unless clinically indicated.
- 1.2.2 Encourage patients to mobilise as soon as possible.
- 1.2.3 Do not regard aspirin or other antiplatelet agents as adequate prophylaxis for VTE.
- 1.2.4 Consider offering temporary inferior vena caval filters to patients who are at very high risk of VTE (such as patients with a previous VTE event or an active malignancy) and for whom mechanical and pharmacological VTE prophylaxis are contraindicated.

## **1.3 *Using VTE prophylaxis***

### **Mechanical VTE prophylaxis**

- 1.3.1 Base the choice of mechanical VTE prophylaxis on individual patient factors including clinical condition, surgical procedure and patient preference. Choose any one of:
  - anti-embolism stockings (thigh or knee length)
  - foot impulse devices
  - intermittent pneumatic compression devices (thigh or knee length).

### ***Anti-embolism stockings***

- 1.3.2 Do not offer anti-embolism stockings to patients who have:
  - suspected or proven peripheral arterial disease
  - peripheral arterial bypass grafting
  - peripheral neuropathy or other causes of sensory impairment
  - any local conditions in which stockings may cause damage, for example fragile 'tissue paper' skin, dermatitis, gangrene or recent skin graft
  - known allergy to material of manufacture
  - cardiac failure

- severe leg oedema or pulmonary oedema from congestive heart failure
- unusual leg size or shape
- major limb deformity preventing correct fit.

Use caution and clinical judgement when applying anti-embolism stockings over venous ulcers or wounds.

- 1.3.3 Ensure that patients who need anti-embolism stockings have their legs measured and that the correct size of stocking is provided. Anti-embolism stockings should be fitted and patients shown how to use them by staff trained in their use.
- 1.3.4 Ensure that patients who develop oedema or postoperative swelling have their legs re-measured and anti-embolism stockings refitted.
- 1.3.5 If arterial disease is suspected, seek expert opinion before fitting anti-embolism stockings.
- 1.3.6 Use anti-embolism stockings that provide graduated compression and produce a calf pressure of 14–15 mmHg.
- 1.3.7 Encourage patients to wear their anti-embolism stockings day and night until they no longer have significantly reduced mobility.
- 1.3.8 Remove anti-embolism stockings daily for hygiene purposes and to inspect skin condition. In patients with a significant reduction in mobility, poor skin integrity or any sensory loss, inspect the skin two or three times per day, particularly over the heels and bony prominences.
- 1.3.9 Discontinue the use of anti-embolism stockings if there is marking, blistering or discolouration of the skin, particularly over the heels and bony prominences, or if the patient experiences pain or discomfort. If suitable, offer a foot impulse or intermittent pneumatic compression device as an alternative.
- 1.3.10 Show patients how to use anti-embolism stockings correctly and ensure they understand that this will reduce their risk of developing VTE.
- 1.3.11 Monitor the use of anti-embolism stockings and offer assistance if they are not being worn correctly.

### ***Foot impulse devices and intermittent pneumatic compression devices***

- 1.3.12 Do not offer foot impulse or intermittent pneumatic compression devices to patients with a known allergy to the material of manufacture.
- 1.3.13 Encourage patients on the ward who have foot impulse or intermittent pneumatic compression devices to use them for as much of the time as is possible and practical, both when in bed and when sitting in a chair.

### **Pharmacological VTE prophylaxis**

- 1.3.14 Base the choice of pharmacological VTE agents on local policies and individual patient factors, including clinical condition (such as renal failure) and patient preferences.

## **1.4 *Medical patients***

### **General medical patients**

- 1.4.1 Offer pharmacological VTE prophylaxis to general medical patients assessed to be at increased risk of VTE (see section [1.1](#)). Choose any one of:
- fondaparinux sodium
  - low molecular weight heparin (LMWH)<sup>6</sup>
  - unfractionated heparin (UFH) (for patients with renal failure).

Start pharmacological VTE prophylaxis as soon as possible after risk assessment has been completed. Continue until the patient is no longer at increased risk of VTE.

---

<sup>6</sup>At the time of publication (January 2010) some types of LMWH do not have UK marketing authorisation for VTE prophylaxis in medical patients. Prescribers should consult the summary of product characteristics for the individual LMWH. Informed consent for off-label use should be obtained and documented.

### **Patients with stroke**

- 1.4.2 Do not offer anti-embolism stockings for VTE prophylaxis to patients who are admitted for stroke.
- 1.4.3 Consider offering prophylactic-dose LMWH<sup>6</sup> (or UFH for patients with renal failure) if:

- a diagnosis of haemorrhagic stroke has been excluded, **and**
- the risk of bleeding (haemorrhagic transformation of stroke or bleeding into another site) is assessed to be low, **and**
- the patient has one or more of:
  - major restriction of mobility
  - previous history of VTE
  - dehydration
  - comorbidities (such as malignant disease).

Continue until the acute event is over and the patient's condition is stable.

- 1.4.4 Until the patient can have pharmacological VTE prophylaxis, consider offering a foot impulse or intermittent pneumatic compression device.

### **Patients with cancer**

- 1.4.5 Offer pharmacological VTE prophylaxis to patients with cancer who are assessed to be at increased risk of VTE (see section [1.1](#)).

Choose any one of:

- fondaparinux sodium
- LMWH<sup>7</sup>
- UFH (for patients with renal failure).

Start pharmacological VTE prophylaxis as soon as possible after risk assessment has been completed. Continue until the patient is no longer at increased risk of VTE.

---

<sup>7</sup>At the time of publication (January 2010) some types of LMWH do not have UK marketing authorisation for VTE prophylaxis in medical patients. Prescribers should consult the summary of product characteristics for the individual LMWH. Informed consent for off-label use should be obtained and documented.

- 1.4.6 Do not routinely offer pharmacological or mechanical VTE prophylaxis to patients with cancer having oncological treatment who are ambulant.

#### **Patients with central venous catheters**

- 1.4.7 Do not routinely offer pharmacological or mechanical VTE prophylaxis to patients with central venous catheters who are ambulant.
- 1.4.8 Consider offering pharmacological VTE prophylaxis with LMWH<sup>8</sup> (or UFH for patients with renal failure) to patients with central venous catheters who are at increased risk of VTE (see section [1.1](#)).

#### **Patients in palliative care**

- 1.4.9 Consider offering pharmacological VTE prophylaxis to patients in palliative care who have potentially reversible acute pathology. Take into account potential risks and benefits and the views of patients and their families and/or carers. Choose any one of:
- fondaparinux sodium
  - LMWH<sup>8</sup>
  - UFH (for patients with renal failure).

---

<sup>8</sup>At the time of publication (January 2010) some types of LMWH do not have UK marketing authorisation for VTE prophylaxis in medical patients. Prescribers should consult the summary of product characteristics for the individual LMWH. Informed consent for off-label use should be obtained and documented.

- 1.4.10 Do not routinely offer pharmacological or mechanical VTE prophylaxis to patients admitted for terminal care or those commenced on an end-of-life care pathway.
- 1.4.11 Review decisions about VTE prophylaxis for patients in palliative care daily, taking into account the views of patients, their families and/or carers and the multidisciplinary team.

**Medical patients in whom pharmacological VTE prophylaxis is contraindicated**

- 1.4.12 Consider offering mechanical VTE prophylaxis to medical patients in whom pharmacological VTE prophylaxis is contraindicated. Choose any one of:
- anti-embolism stockings (thigh or knee length)
  - foot impulse devices
  - intermittent pneumatic compression devices (thigh or knee length).

## **1.5 Surgical patients**

### **All surgery**

- 1.5.1 Advise patients to consider stopping oestrogen-containing oral contraceptives or hormone replacement therapy 4 weeks before elective surgery. If stopped, provide advice on alternative contraceptive methods.
- 1.5.2 Assess the risks and benefits of stopping pre-existing established antiplatelet therapy 1 week before surgery. Consider involving the multidisciplinary team in the assessment.
- 1.5.3 Consider regional anaesthesia for individual patients, in addition to other methods of VTE prophylaxis, as it carries a lower risk of VTE than general anaesthesia. Take into account patients' preferences, their suitability for regional anaesthesia and any other planned method of VTE prophylaxis.
- 1.5.4 If regional anaesthesia is used, plan the timing of pharmacological VTE prophylaxis to minimise the risk of epidural haematoma. If antiplatelet or anticoagulant agents are being used, or their use is planned, refer to the summary of product characteristics for guidance about the safety and timing of these agents in relation to the use of regional anaesthesia.
- 1.5.5 Do not routinely offer pharmacological or mechanical VTE prophylaxis to patients undergoing a surgical procedure with local anaesthesia by local infiltration with no limitation of mobility.

### **Cardiac**

- 1.5.6 Offer VTE prophylaxis to patients undergoing cardiac surgery who are not having other anticoagulation therapy and are assessed to be at increased risk of VTE (see section [1.1](#)).
- Start mechanical VTE prophylaxis at admission. Choose any one of:
    - anti-embolism stockings (thigh or knee length)
    - foot impulse devices

- intermittent pneumatic compression devices (thigh or knee length).

Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.

- Add pharmacological VTE prophylaxis for patients who have a low risk of major bleeding, taking into account individual patient factors and according to clinical judgement. Choose one of:
  - LMWH
  - UFH (for patients with renal failure).

Continue pharmacological VTE prophylaxis until the patient no longer has significantly reduced mobility (generally 5–7 days).

### **Gastrointestinal, gynaecological, thoracic and urological**

1.5.7 Offer VTE prophylaxis to patients undergoing bariatric surgery.

- Start mechanical VTE prophylaxis at admission. Choose any one of:
  - anti-embolism stockings (thigh or knee length)
  - foot impulse devices
  - intermittent pneumatic compression devices (thigh or knee length).

Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.

- Add pharmacological VTE prophylaxis for patients who have a low risk of major bleeding, taking into account individual patient factors and according to clinical judgement. Choose any one of:
  - fondaparinux sodium
  - LMWH
  - UFH (for patients with renal failure).

Continue pharmacological VTE prophylaxis until the patient no longer has significantly reduced mobility (generally 5–7 days).

- 1.5.8 Offer VTE prophylaxis to patients undergoing gastrointestinal surgery who are assessed to be at increased risk of VTE (see section [1.1](#)).
- Start mechanical VTE prophylaxis at admission. Choose any one of:
    - anti-embolism stockings (thigh or knee length)
    - foot impulse devices
    - intermittent pneumatic compression devices (thigh or knee length).Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.
  - Add pharmacological VTE prophylaxis for patients who have a low risk of major bleeding, taking into account individual patient factors and according to clinical judgement. Choose any one of:
    - fondaparinux sodium
    - LMWH
    - UFH (for patients with renal failure).Continue pharmacological VTE prophylaxis until the patient no longer has significantly reduced mobility (generally 5–7 days).

- 1.5.9 Offer VTE prophylaxis to patients undergoing gynaecological, thoracic or urological surgery who are assessed to be at increased risk of VTE (see section [1.1](#)).
- Start mechanical VTE prophylaxis at admission. Choose any one of:
    - anti-embolism stockings (thigh or knee length)
    - foot impulse devices
    - intermittent pneumatic compression devices (thigh or knee length).Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.

- Add pharmacological VTE prophylaxis for patients who have a low risk of major bleeding, taking into account individual patient factors and according to clinical judgement. Choose one of:
  - LMWH
  - UFH (for patients with renal failure).
 Continue pharmacological VTE prophylaxis until the patient no longer has significantly reduced mobility (generally 5–7 days).

1.5.10 Extend pharmacological VTE prophylaxis to 28 days postoperatively for patients who have had major cancer surgery in the abdomen or pelvis.

### **Neurological (cranial or spinal)**

- 1.5.11 Offer VTE prophylaxis to patients undergoing cranial or spinal surgery who are assessed to be at increased risk of VTE (see section [1.1](#)).
- Start mechanical VTE prophylaxis at admission. Choose any one of:
    - anti-embolism stockings (thigh or knee length)
    - foot impulse devices
    - intermittent pneumatic compression devices (thigh or knee length).
 Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.
  - Add pharmacological VTE prophylaxis for patients who have a low risk of major bleeding, taking into account individual patient factors and according to clinical judgement. Choose one of:
    - LMWH
    - UFH (for patients with renal failure).
 Continue pharmacological VTE prophylaxis until the patient no longer has significantly reduced mobility (generally 5–7 days).

1.5.12 Do not offer pharmacological VTE prophylaxis to patients with ruptured cranial or spinal vascular malformations (for example,

brain aneurysms) or acute traumatic or non-traumatic haemorrhage until the lesion has been secured or the condition is stable.

### **Orthopaedic surgery – elective hip replacement, elective knee replacement and hip fracture**

The summaries of product characteristics state postoperative start times for dabigatran, rivaroxaban and fondaparinux, and preoperative start times for most LMWHs, although individual start times vary depending on the specific LMWH. In this guideline it is recommended that LMWH is started postoperatively, which is off-label use, because of concerns about the risk of bleeding into the joint. Patients would be protected preoperatively by mechanical VTE prophylaxis.

#### ***Elective hip replacement***

1.5.13 Offer combined VTE prophylaxis with mechanical and pharmacological methods to patients undergoing elective hip replacement surgery.

- Start mechanical VTE prophylaxis at admission. Choose any one of the following, based on individual patient factors:
  - anti-embolism stockings (thigh or knee length), used with caution (see recommendations [1.3.2–1.3.11](#))
  - foot impulse devices
  - intermittent pneumatic compression devices (thigh or knee length).

Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.

- Provided there are no contraindications, start pharmacological VTE prophylaxis after surgery. Choose any one of:
  - dabigatran etexilate, starting 1–4 hours after surgery<sup>9</sup>

---

<sup>9</sup>In line with 'Dabigatran etexilate for the prevention of venous thromboembolism after hip or knee replacement surgery in adults' (NICE technology appraisal guidance 157), dabigatran etexilate, within its marketing authorisation, is recommended as an option for the primary prevention of venous thromboembolic events in adults who have undergone elective total hip replacement surgery or elective total knee replacement surgery.

- fondaparinux sodium, starting 6 hours after surgical closure provided haemostasis has been established
- LMWH, starting 6–12 hours after surgery
- rivaroxaban, starting 6–10 hours after surgery<sup>10</sup>
- UFH (for patients with renal failure), starting 6–12 hours after surgery.

Continue pharmacological VTE prophylaxis for 28–35 days, according to the summary of product characteristics for the individual agent being used.

### ***Elective knee replacement***

1.5.14 Offer combined VTE prophylaxis with mechanical and pharmacological methods to patients undergoing elective knee replacement surgery.

- Start mechanical VTE prophylaxis at admission. Choose any one of the following, based on individual patient factors:
  - anti-embolism stockings (thigh or knee length), used with caution (see recommendations [1.3.2–1.3.11](#))
  - foot impulse devices
  - intermittent pneumatic compression devices (thigh or knee length).

Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.

- Provided there are no contraindications, start pharmacological VTE prophylaxis after surgery. Choose any one of:
  - dabigatran etexilate, starting 1–4 hours after surgery<sup>11</sup>

---

<sup>10</sup>In line with 'Rivaroxaban for the prevention of venous thromboembolism after total hip or total knee replacement in adults' (NICE technology appraisal guidance 170), rivaroxaban, within its marketing authorisation, is recommended as an option for the prevention of venous thromboembolism in adults having elective total hip replacement surgery or elective total knee replacement surgery.

<sup>11</sup>In line with 'Dabigatran etexilate for the prevention of venous thromboembolism after hip or knee replacement surgery in adults' (NICE technology appraisal guidance 157), dabigatran etexilate, within its marketing authorisation, is recommended as an option for the primary prevention of venous thromboembolic events in adults who have undergone elective total hip replacement surgery or elective total knee replacement surgery.

- fondaparinux sodium, starting 6 hours after surgical closure provided haemostasis has been established
- LMWH, starting 6–12 hours after surgery
- rivaroxaban, starting 6–10 hours after surgery<sup>12</sup>
- UFH (for patients with renal failure), starting 6–12 hours after surgery.

Continue pharmacological VTE prophylaxis for 10–14 days, according to the summary of product characteristics for the individual agent being used.

### ***Hip fracture***

1.5.15 Offer combined VTE prophylaxis with mechanical and pharmacological methods to patients undergoing hip fracture surgery.

- Start mechanical VTE prophylaxis at admission. Choose any one of the following, based on individual patient factors:
  - anti-embolism stockings (thigh or knee length), used with caution (see recommendations [1.3.2–1.3.11](#))
  - foot impulse devices
  - intermittent pneumatic compression devices (thigh or knee length).

Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.

- Provided there are no contraindications, add pharmacological VTE prophylaxis. Choose any one of:

---

<sup>12</sup>In line with ‘Rivaroxaban for the prevention of venous thromboembolism after total hip or total knee replacement in adults’ (NICE technology appraisal guidance 170), rivaroxaban, within its marketing authorisation, is recommended as an option for the prevention of venous thromboembolism in adults having elective total hip replacement surgery or elective total knee replacement surgery.

- fondaparinux sodium, starting 6 hours after surgical closure, provided haemostasis has been established and there is no risk of bleeding (see [box 2](#))
- LMWH, starting at admission, stopping 12 hours before surgery and restarting 6–12 hours after surgery
- UFH (for patients with renal failure), starting at admission, stopping 12 hours before surgery and restarting 6–12 hours after surgery.

Continue pharmacological VTE prophylaxis for 28–35 days, according to the summary of product characteristics for the individual agent being used.

- 1.5.16 Fondaparinux sodium is not recommended for use preoperatively for patients undergoing hip fracture surgery. If it has been used preoperatively it should be stopped 24 hours before surgery and restarted 6 hours after surgical closure, provided haemostasis has been established and there is no risk of bleeding (see [box 2](#)).

### ***Other orthopaedic surgery***

- 1.5.17 Consider offering combined VTE prophylaxis with mechanical and pharmacological methods to patients having orthopaedic surgery (other than hip replacement, knee replacement or hip fracture surgery) based on an assessment of risks (see section 1.1) and after discussion with the patient.
- Start mechanical VTE prophylaxis at admission. Choose one of the following, based on individual patient factors:
    - anti-embolism stockings (thigh or knee length), used with caution (see recommendations [1.3.2–1.3.11](#))
    - foot impulse devices
    - intermittent pneumatic compression devices (thigh or knee length).

Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.

- Start pharmacological VTE prophylaxis 6–12 hours after surgery.

Choose one of:

- LMWH
- UFH (for patients with renal failure).

Continue pharmacological VTE prophylaxis until the patient no longer has significantly reduced mobility.

- 1.5.18 Do not routinely offer VTE prophylaxis to patients undergoing upper limb surgery. If a patient is assessed to be at increased risk of VTE (see section [1.1](#)), refer to recommendation [1.5.17](#).

### **Vascular**

- 1.5.19 Offer VTE prophylaxis to patients undergoing vascular surgery who are not having other anticoagulant therapy and are assessed to be at increased risk of VTE (see section [1.1](#)). If peripheral arterial disease is present, seek expert opinion before fitting anti-embolism stockings.

- Start mechanical VTE prophylaxis at admission. Choose any one of:
  - anti-embolism stockings (thigh or knee length)
  - foot impulse devices
  - intermittent pneumatic compression devices (thigh or knee length).

Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.

- Add pharmacological VTE prophylaxis for patients who have a low risk of major bleeding, taking into account individual patient factors and according to clinical judgement. Choose one of:
  - LMWH
  - UFH (for patients with renal failure).

Continue pharmacological VTE prophylaxis until the patient no longer has significantly reduced mobility (generally 5–7 days).

## Day surgery

1.5.20 Offer VTE prophylaxis to patients undergoing day surgery who are assessed to be at increased risk of VTE (see section [1.1](#)).

- Start mechanical VTE prophylaxis at admission. Choose any one of:
  - anti-embolism stockings (thigh or knee length)
  - foot impulse devices
  - intermittent pneumatic compression devices (thigh or knee length).

Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.

- Add pharmacological VTE prophylaxis for patients who have a low risk of major bleeding, taking into account individual patient factors and according to clinical judgement. Choose any one of:
  - fondaparinux
  - LMWH
  - UFH (for patients with renal failure).

If the patient is expected to have significantly reduced mobility after discharge, continue pharmacological VTE prophylaxis, generally for 5–7 days.

## Other surgical patients

1.5.21 Offer VTE prophylaxis to patients undergoing surgery other than that covered in recommendations [1.5.6–1.5.20](#) who are assessed to be at increased risk of VTE (see section [1.1](#)).

- Start mechanical VTE prophylaxis at admission. Choose any one of:
  - anti-embolism stockings (thigh or knee length)
  - foot impulse devices
  - intermittent pneumatic compression devices (thigh or knee length).

Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.

- Add pharmacological VTE prophylaxis for patients who have a low risk of major bleeding, taking into account individual patient factors and according to clinical judgement. Choose one of:
  - LMWH
  - UFH (for patients with renal failure).

Continue pharmacological VTE prophylaxis until the patient no longer has significantly reduced mobility (generally 5–7 days).

## **1.6 Other patient groups**

### **Major trauma**

1.6.1 Offer combined VTE prophylaxis with mechanical and pharmacological methods to patients with major trauma. Regularly reassess the patient's risks of VTE and bleeding.

- Start mechanical VTE prophylaxis at admission or as early as clinically possible. Choose any one of:
  - anti-embolism stockings (thigh or knee length), used with caution (see recommendations [1.3.2–1.3.11](#))
  - foot impulse devices
  - intermittent pneumatic compression devices (thigh or knee length).

Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.

- If the benefits of reducing the risk of VTE outweigh the risks of bleeding (see [box 2](#)) and the bleeding risk has been established as low, add pharmacological VTE prophylaxis. Choose one of:
  - LMWH
  - UFH (for patients with renal failure).

Continue pharmacological VTE prophylaxis until the patient no longer has significantly reduced mobility.

## Spinal injury

1.6.2 Offer combined VTE prophylaxis with mechanical and pharmacological methods to patients with spinal injury. Regularly reassess the patient's risks of VTE and bleeding.

- Start mechanical VTE prophylaxis at admission or as early as clinically possible. Choose any one of:
  - anti-embolism stockings (thigh or knee length), used with caution (see recommendations [1.3.2–1.3.11](#))
  - foot impulse devices
  - intermittent pneumatic compression devices (thigh or knee length).

Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.

- If the benefits of reducing the risk of VTE outweigh the risks of bleeding (see [box 2](#)) and the bleeding risk has been established as low, add pharmacological VTE prophylaxis. Choose one of:
  - LMWH
  - UFH (for patients with renal failure).

Continue pharmacological VTE prophylaxis until the patient no longer has significantly reduced mobility.

## Lower limb plaster casts

1.6.3 Consider offering pharmacological VTE prophylaxis to patients with lower limb plaster casts after evaluating the risks (see section [1.1](#)) and benefits based on clinical discussion with the patient. Offer LMWH (or UFH for patients with renal failure) until lower limb plaster cast removal.

## Pregnancy and up to 6 weeks post partum

1.6.4 Consider offering pharmacological VTE prophylaxis with LMWH (or UFH for patients with renal failure) to women who are pregnant or have given birth within the previous 6 weeks who are admitted to

hospital but are not undergoing surgery, and who have one or more of the following risk factors:

- expected to have significantly reduced mobility for 3 or more days
- active cancer or cancer treatment
- age over 35 years
- critical care admission
- dehydration
- excess blood loss or blood transfusion
- known thrombophilias
- obesity (pre-pregnancy or early pregnancy BMI over 30 kg/m<sup>2</sup>)
- one or more significant medical comorbidities (for example: heart disease; metabolic, endocrine or respiratory pathologies; acute infectious diseases; inflammatory conditions)
- personal history or a first-degree relative with a history of VTE
- pregnancy-related risk factor (such as ovarian hyperstimulation, hyperemesis gravidarum, multiple pregnancy or pre-eclampsia)
- varicose veins with phlebitis.

- 1.6.5 Consider offering combined VTE prophylaxis with mechanical methods and LMWH (or UFH for patients with renal failure) to women who are pregnant or have given birth within the previous 6 weeks who are undergoing surgery, including caesarean section.
- 1.6.6 Offer mechanical and/or pharmacological VTE prophylaxis to women who are pregnant or have given birth within the previous 6 weeks only after assessing the risks and benefits and discussing these with the woman and with healthcare professionals who have knowledge of the proposed method of VTE prophylaxis during pregnancy and post partum. Plan when to start and stop pharmacological VTE prophylaxis to minimise the risk of bleeding.

### **Critical care**

- 1.6.7 Assess all patients on admission to the critical care unit for their risks of VTE (see section [1.1](#)) and bleeding (see [box 2](#)). Reassess patients' risks of VTE and bleeding daily and more frequently if their clinical condition is changing rapidly.
- 1.6.8 Offer VTE prophylaxis to patients admitted to the critical care unit according to the reason for admission, taking into account:
- any planned interventions
  - the use of other therapies that may increase the risk of complications.
- 1.6.9 Review decisions about VTE prophylaxis for patients in critical care daily and more frequently if their clinical condition is changing rapidly. Take into account the known views of the patient, comments from their family and/or carers and the multidisciplinary team.

### **Patients already having antiplatelet agents or anticoagulation on admission or needing them for treatment**

- 1.6.10 Consider offering additional mechanical or pharmacological VTE prophylaxis to patients who are having antiplatelet agents to treat other conditions and who are assessed to be at increased risk of

VTE (see section [1.1](#)). Take into account the risk of bleeding (see [box 2](#)) and of comorbidities such as arterial thrombosis.

- If the risk of VTE outweighs the risk of bleeding, consider offering pharmacological VTE prophylaxis according to the reason for admission.
- If the risk of bleeding outweighs the risk of VTE, offer mechanical VTE prophylaxis.

1.6.11 Do not offer additional pharmacological or mechanical VTE prophylaxis to patients who are taking vitamin K antagonists and who are within their therapeutic range, providing anticoagulant therapy is continued.

1.6.12 Do not offer additional pharmacological or mechanical VTE prophylaxis to patients who are having full anticoagulant therapy (for example, fondaparinux sodium, LMWH or UFH).

## **1.7 Patient information and planning for discharge**

### **Patient information**

1.7.1 Be aware that heparins are of animal origin and this may be of concern to some patients<sup>13</sup>. For patients who have concerns about using animal products, consider offering synthetic alternatives based on clinical judgement and after discussing their suitability, advantages and disadvantages with the patient.

1.7.2 Before starting VTE prophylaxis, offer patients and/or their families or carers verbal and written information on:

- the risks and possible consequences of VTE
- the importance of VTE prophylaxis and its possible side effects
- the correct use of VTE prophylaxis (for example, anti-embolism stockings, foot impulse or intermittent pneumatic compression devices).

---

<sup>13</sup>See 'Religion or belief: a practical guide for the NHS', available from [www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH\\_093133](http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_093133)

- how patients can reduce their risk of VTE (such as keeping well hydrated and, if possible, exercising and becoming more mobile).

### **Planning for discharge**

1.7.3 As part of the discharge plan, offer patients and/or their families or carers verbal and written information on:

- the signs and symptoms of deep vein thrombosis and pulmonary embolism
- the correct and recommended duration of use of VTE prophylaxis at home (if discharged with prophylaxis)
- the importance of using VTE prophylaxis correctly and continuing treatment for the recommended duration (if discharged with prophylaxis)
- the signs and symptoms of adverse events related to VTE prophylaxis (if discharged with prophylaxis)
- the importance of seeking help and who to contact if they have any problems using the prophylaxis (if discharged with prophylaxis)
- the importance of seeking medical help and who to contact if deep vein thrombosis, pulmonary embolism or other adverse events are suspected.

1.7.4 Ensure that patients who are discharged with anti-embolism stockings:

- understand the benefits of wearing them
- understand the need for daily hygiene removal
- are able to remove and replace them, or have someone available who will be able to do this for them
- know what to look for, such as skin marking, blistering or discolouration, particularly over the heels and bony prominences
- know who to contact if there is a problem.

- 1.7.5 Ensure that patients who are discharged with pharmacological and/or mechanical VTE prophylaxis are able to use it correctly, or have arrangements made for someone to be available who will be able to help them.
- 1.7.6 Notify the patient's GP if the patient has been discharged with pharmacological and/or mechanical VTE prophylaxis to be used at home.

## **2 Notes on the scope of the guidance**

NICE guidelines are developed in accordance with a scope that defines what the guideline will and will not cover. The scope of this guideline is available from [www.nice.org.uk/guidance/CG92](http://www.nice.org.uk/guidance/CG92)

### **Groups that will be covered**

a) Adults (18 years and older) admitted to hospital as inpatients or formally admitted to a hospital bed for day-case procedures, including:

- surgical inpatients
- inpatients with acute medical illness (for example, myocardial infarction, stroke, spinal cord injury, severe infection or exacerbation of chronic obstructive pulmonary disease)
- trauma inpatients
- patients admitted to intensive care units
- cancer inpatients
- people undergoing long-term rehabilitation in hospital
- patients admitted to a hospital bed for day-case medical or surgical procedures.

b) Within this population, pregnant women admitted to hospital have been identified as a group requiring special consideration.

c) During the review of the evidence, any additional groups that are shown to have particular clinical needs will be given special consideration.

### **Groups that will not be covered**

- a) People younger than 18 years.
- b) People attending hospital as outpatients.
- c) People presenting to emergency departments without admission.
- d) Elderly or immobile people cared for at home, or in external residential accommodation, unless admitted to hospital.
- e) Patients admitted to hospital with a diagnosis of, or suspected diagnosis of, deep vein thrombosis or pulmonary embolus.

### **How this guideline was developed**

NICE commissioned the National Clinical Guideline Centre for Acute and Chronic Conditions (formerly the National Collaborating Centre for Acute Care) to develop this guideline. The Centre established a Guideline Development Group (see appendix A), which reviewed the evidence and developed the recommendations. An independent guideline review panel oversaw the development of the guideline (see appendix B).

There is more information about how NICE clinical guidelines are developed on the NICE website [www.nice.org.uk/HowWeWork](http://www.nice.org.uk/HowWeWork). A booklet, 'How NICE clinical guidelines are developed: an overview for stakeholders, the public and the NHS' (fourth edition, published 2009), is available from NICE publications (phone 0845 003 7783 or email [publications@nice.org.uk](mailto:publications@nice.org.uk) and quote reference N1739).

## **3 Implementation**

NICE has developed tools to help organisations implement this guidance (see [www.nice.org.uk/guidance/CG92](http://www.nice.org.uk/guidance/CG92)).

## **4 Research recommendations**

The Guideline Development Group has made the following recommendations for research, based on its review of evidence, to improve NICE guidance and patient care in the future.

### **4.1 *Assessing the risk of VTE***

What is the absolute risk of VTE among different groups of hospital patients, and can the risk be reliably estimated on admission to hospital to ensure that appropriate patients are offered VTE prophylaxis?

#### **Why this is important**

One of the most difficult areas the Guideline Development Group faced when developing the guideline was to identify the absolute risk of VTE among specific patient groups in relation to the reason for admission. A new, large pragmatic cohort study and/or record linkage study using Hospital Episode Statistics and the General Practice Research Database is proposed. This would allow all people admitted to hospital to be studied to identify those who develop VTE, including people who are diagnosed with VTE in primary care after discharge from hospital. Information on baseline patient-related factors, procedures and duration of stay, complications, prophylactic therapies and concomitant drug use should be collected and analysed. It should allow the identification of independent risk factors for VTE and the development and subsequent validation of a risk model to estimate the absolute risk of VTE in individual patients. This research would allow clearer identification of those patients at risk of VTE and those in whom the risk is so low that the bleeding risk of pharmacological VTE prophylaxis would add overall hazard.

### **4.2 *VTE prophylaxis for medical patients***

What is the clinical and cost effectiveness of pharmacological prophylaxis, mechanical prophylaxis and combined pharmacological and mechanical prophylaxis for reducing the risk of VTE in medical patients?

### **Why this is important**

Only a small number of trials with medical patients were identified and generally the inclusion criteria were narrow, for example, patients with an acute medical illness, with a hospital stay of more than 5 days, and often with severely limited mobility. Further research into less severely ill patient groups would be beneficial.

The evidence concerning mechanical VTE prophylaxis in medical patients is sparse. There have been a few small trials of patients with coronary syndrome but the only large, randomised controlled trial was of patients with stroke. This trial showed that routine care plus thigh-length anti-embolism stockings did not confer significantly more protection against VTE than routine care alone and was associated with significantly more harm. All of these trials included large proportions of patients who were taking aspirin, which may have influenced the results.

New trial(s) should investigate the benefits of reducing the risk of VTE balanced against the risk of bleeding. The trial(s) should compare pharmacological VTE prophylaxis alone, mechanical VTE prophylaxis alone, and combined mechanical and pharmacological VTE prophylaxis. The benefit of extended-duration VTE prophylaxis in medical patient groups may also be investigated.

### **4.3 VTE prophylaxis for patients with lower limb plaster casts**

What is the clinical and cost effectiveness of pharmacological prophylaxis for reducing the risk of VTE in patients with lower limb plaster casts?

### **Why this is important**

A number of randomised controlled trials have been published reporting the use of VTE prophylaxis in patients with lower limb plaster casts. However, within these trials there has been a range of patients, including patients with soft tissue injuries and no operation, those with operated and unoperated fractures and patients having elective surgical procedures. The incidence of VTE in the published trials that did not use VTE prophylaxis ranges from

4–40%. The implications of providing pharmacological VTE prophylaxis for all patients with lower limb plaster casts are potentially considerable with respect to cost. Trials stratifying patients by reason for plaster cast would be useful to determine which patients should be recommended for VTE prophylaxis.

#### **4.4 *VTE prophylaxis for patients after stroke***

What are the overall risks/benefits of LMWH and/or fondaparinux sodium in respect of both stroke outcome and the development of VTE for patients with acute stroke?

##### **Why this is important**

Patients with either ischaemic or haemorrhagic stroke have a risk of both VTE and bleeding into the brain. 'Stroke: diagnosis and management of acute stroke and transient attack [TIA]' (NICE clinical guideline 68, published July 2008) recommends the use of aspirin for treatment of ischaemic stroke but does not recommend anticoagulants. There is recent evidence to suggest that prophylactic doses of anticoagulants in addition to aspirin reduce the risk of VTE in patients with ischaemic stroke, but there are no data showing an effect of these anticoagulants on the stroke itself. Do they increase the risk of haemorrhagic transformation and so increase neurological damage? This research should include patients with haemorrhagic or ischaemic strokes to identify which patients would benefit from additional pharmacological VTE prophylaxis.

#### **4.5 *Incidence of post-thrombotic syndrome after VTE***

What is the incidence, loss of quality of life and cost associated with post-thrombotic syndrome after potentially preventable deep vein thrombosis?

##### **Why this is important**

During development of the guideline it became apparent that the incidence of post-thrombotic syndrome, particularly after asymptomatic deep vein thrombosis, was not well reported. This study should use standard, validated definitions to identify the incidence of post-thrombotic syndrome both when a deep vein thrombosis has occurred as a result of a hospital admission and in

the absence of hospital-acquired deep vein thrombosis. The study should also aim to identify the costs to the NHS of treating post-thrombotic syndrome.

## **5 Other versions of this guideline**

### **5.1 Full guideline**

The full guideline 'Reducing the risk of venous thromboembolism (deep vein thrombosis and pulmonary embolism) in patients admitted to hospital' contains details of the methods and evidence used to develop the guideline. It is published by the National Clinical Guideline Centre for Acute and Chronic Conditions and is available from our website ([www.nice.org.uk/guidance/CG92/Guidance](http://www.nice.org.uk/guidance/CG92/Guidance)).

### **5.2 Quick reference guide**

A quick reference guide for healthcare professionals is available from [www.nice.org.uk/guidance/CG92/QuickRefGuide](http://www.nice.org.uk/guidance/CG92/QuickRefGuide)

For printed copies, phone NICE publications on 0845 003 7783 or email [publications@nice.org.uk](mailto:publications@nice.org.uk) (quote reference number N2080).

### **5.3 'Understanding NICE guidance'**

A summary for patients and carers ('Understanding NICE guidance') is available from [www.nice.org.uk/guidance/CG92/PublicInfo](http://www.nice.org.uk/guidance/CG92/PublicInfo)

For printed copies, phone NICE publications on 0845 003 7783 or email [publications@nice.org.uk](mailto:publications@nice.org.uk) (quote reference number N2081).

We encourage NHS and voluntary sector organisations to use text from this booklet in their own information about reducing the risk of VTE in patients admitted to hospital.

## **6 Related NICE guidance**

Rivaroxaban for the prevention of venous thromboembolism after total hip or total knee replacement in adults. NICE technology appraisal guidance 170 (2009). Available from [www.nice.org.uk/guidance/TA170](http://www.nice.org.uk/guidance/TA170)

Dabigatran etexilate for the prevention of venous thromboembolism after hip or knee replacement surgery in adults. NICE technology appraisal guidance 157 (2008). Available from [www.nice.org.uk/guidance/TA157](http://www.nice.org.uk/guidance/TA157)

## **7            Updating the guideline**

NICE clinical guidelines are updated so that recommendations take into account important new information. New evidence is checked 3 years after publication, and healthcare professionals and patients are asked for their views; we use this information to decide whether all or part of a guideline needs updating. If important new evidence is published at other times, we may decide to do a more rapid update of some recommendations.

## **Appendix A: The Guideline Development Group and NICE Project Team**

### *Guideline Development Group*

#### **Professor Tom Treasure (Chair)**

Honorary Professor and Honorary Consultant, Clinical Operational Research Unit, University College London

#### **Mrs Kim Carter**

DVT Nurse Specialist, Portsmouth Hospitals NHS Trust, Queen Alexandra Hospital, Portsmouth

#### **Dr Nandan Gautam**

Consultant in General Medicine and Critical Care, Selly Oak Hospital, Birmingham

#### **Professor Aroon Hingorani**

Professor of Genetic Epidemiology, British Heart Foundation Senior Research Fellow, and Honorary Consultant Physician, University College London Hospitals NHS Foundation Trust

#### **Dr Rodney Hughes**

Consultant Respiratory Physician, Northern General Hospital, Sheffield

#### **Professor Beverley Hunt**

Consultant in Departments of Haematology, Pathology and Rheumatology, Guy's and St. Thomas' Foundation Trust, London

#### **Dr Nigel Langford**

Consultant Physician and Clinical Pharmacologist, City Hospital, Birmingham

#### **Mr Paul Mainwaring**

Patient representative, Bury

**Mr Donald McBride<sup>14</sup>**

Consultant Orthopaedic Surgeon, University Hospital North Staffordshire

**Gordon McPherson<sup>15</sup>**

Patient representative, Renfrewshire

**Dr Simon Noble**

Clinical Senior Lecturer and Honorary Consultant in Palliative Medicine, Royal Gwent Hospital, Newport

**Professor Gerard Stansby**

Professor of Vascular Surgery, Freeman Hospital, Newcastle upon Tyne

**Dr Peter Walton<sup>16</sup>**

Patient representative, Cheshire

**Ms Annie Young**

Nurse Director, 3 Counties Cancer Network, Gloucestershire, Herefordshire and South Worcestershire

*Members of the Orthopaedic Subgroup*

**Professor Tom Treasure (Chair)**

Honorary Professor and Honorary Consultant, Clinical Operational Research Unit, University College London

**Mrs Kim Carter**

DVT Nurse Specialist, Portsmouth Hospitals NHS Trust, Queen Alexandra Hospital, Portsmouth

**Mr Simon Carter**

Consultant Orthopaedic Oncologist, Royal Orthopaedic Hospital, Birmingham

**Mr Nick Fiddian**

Consultant Orthopaedic Surgeon, Royal Bournemouth Hospital

---

<sup>14</sup> From September 2008

<sup>15</sup> From September 2007 until January 2008

<sup>16</sup> From February 2008

**Professor Simon Frostick**

Professor of Orthopaedics, Royal Liverpool University Hospital, Liverpool

**Professor Paul Gregg**

Consultant Orthopaedic Surgeon, The James Cook University Hospital,  
Middlesbrough

**Mr Donald McBride**

Consultant Orthopaedic Surgeon, University Hospital North Staffordshire

**Mr David Warwick**

Consultant Orthopaedic Surgeon, Southampton University Hospital

**Mr Nick Welch**

Patient representative, Derbyshire

**Ms Claire Young**

Consultant Orthopaedic Surgeon, Cumberland Infirmary, Carlisle

*National Clinical Guideline Centre for Acute and Chronic  
Conditions (NCGC–ACC) staff on the Guideline  
Development Group*

**Mrs Karen Head<sup>17</sup>**

Senior Research Fellow/Project Manager

**Dr Anayo Akunne<sup>18</sup>**

Health Economist

**Mrs Nina Balachander<sup>19</sup>**

Senior Research Fellow/Project Manager

**Dr Lee Yee Chong<sup>20</sup>**

Research Fellow

---

<sup>17</sup> Until August 2009

<sup>18</sup> From June 2008

<sup>19</sup> From July 2009

<sup>20</sup> From March 2008

**Dr Jennifer Hill**

Operations Director NCGC–ACC

**Ms Kate Homer<sup>21</sup>**

Research Associate

**Ms Hanna Lewin<sup>22</sup>**

Information Specialist

**Mr Carlos Sharpin**

Senior Information Scientist/Research Fellow

**Ms Nicola Sloan<sup>23</sup>**

Research Associate

**Mr David Wonderling**

Health Economics Lead

*Members of the previous Guideline Development Group for ‘Venous thromboembolism: reducing the risk of venous thromboembolism (deep vein thrombosis and pulmonary embolism) in inpatients undergoing surgery’ (NICE clinical guideline 46)*

**Professor Tom Treasure (Chair)**

Consultant Thoracic Surgeon, Guys Hospital, London

**Mr Nigel Acheson**

Consultant Gynaecological Oncologist, Royal Devon and Exeter Hospital

**Dr Ricky Autar**

Principal Lecturer, De Montfort University, Leicester and Honorary Clinical Nurse Consultant, University Hospitals of Leicester (UHLs) NHS Trust

---

<sup>21</sup> From September 2007 until January 2008

<sup>22</sup> From September until January 2009

<sup>23</sup> From September 2007 until January 2008

**Professor Colin Baigent**

Clinical Epidemiologist, Clinical Trial Service Unit (CTSU), Oxford

**Mrs Kim Carter**

DVT Nurse Specialist, Portsmouth Hospitals NHS Trust, Queen Alexandra Hospital, Portsmouth

**Mr Simon Carter**

Consultant Orthopaedic Oncologist, Royal Orthopaedic Hospital, Birmingham

**Mr David Farrell**

Patient representative

**Dr David Goldhill**

Consultant Anaesthetist, The Royal National Orthopaedic Hospital, Stanmore

**Dr John Luckit**

Consultant Haematologist, North Middlesex University Hospital

**Mr Robin Offord**

Director of Clinical Pharmacy, University College Hospital, London

**Mr Adam Thomas**

Patient representative

*National Clinical Guideline Centre for Acute and Chronic Conditions (formerly National Collaborating Centre for Acute Care [NCC-AC]) staff on the previous Guideline Development Group*

**Dr Jennifer Hill**

Director of NCC-AC/Project Manager

**Dr Philippa Davies**

Research Associate/Project Manager

**Dr Saoussen Ftouh<sup>24</sup>**

Research Fellow/Project Manager

---

<sup>24</sup>From October 2006.

**Mr Enrico De Nigris**

Health Economist

**Mr Peter B Katz**

Information Scientist

**Dr Arash Rashidian**

Methodological Adviser

**Mr Carlos Sharpin**

Information Scientist/Research Associate

**Mr David Wonderling**

Senior Health Economist

*NICE Project Team*

**Christine Carson**

Associate Director

**Sarah Willett**

Guidelines Commissioning Manager

**Andrew Gyton**

Guidelines Coordinator

**Nichole Taske**

Technical Lead

## **Appendix B: The Guideline Review Panel**

The Guideline Review Panel is an independent panel that oversees the development of the guideline and takes responsibility for monitoring adherence to NICE guideline development processes. In particular, the panel ensures that stakeholder comments have been adequately considered and responded to. The panel includes members from the following perspectives: primary care, secondary care, lay, public health and industry.

### **Mr Peter Robb (Chair)**

Consultant ENT Surgeon, Epsom and St Helier University Hospitals and The Royal Surrey County Hospital NHS Trusts

### **Mr Mike Baldwin**

Head of Technology Appraisals, Sanofi-Aventis

### **Dr Christine Hine**

Consultant in Public Health (Acute Commissioning), Bristol and South Gloucestershire Primary Care Trusts

### **Mr John Seddon**

Lay member

## **Appendix C: The algorithms**

For the algorithms see the quick reference guide at [www.nice.org.uk/guidance/CG92/QuickRefGuide](http://www.nice.org.uk/guidance/CG92/QuickRefGuide)