Guideline for
Prevention of Venous Thrombo-Embolism (VTE) in patients admitted to Critical Care Unit

Developed by -

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These are clinical guidelines only. The interpretation and application of clinical guidelines will remain the responsibility of the individual clinician.

Background

Venous thromboembolism (VTE) has been found to be one of the most common complications in the critical care patient population.
The reported incidence of deep vein thrombosis (DVT) in intensive care unit (ICU) patients, using routine venography or doppler ultrasound, ranges from < 10% to almost 100%, reflecting the wide spectrum of critically ill patients.

The risks of VTE in surgical, obstetrics, trauma and acutely ill medical patients are well established and are relevant to the critical care population, which is principally composed of these subgroups.

A majority of ICU patients carry at least one risk factor for VTE. Additional risk factors are considered to have a cumulative effect. Some of these risk factors predate admission to the ICU, and include recent surgery, trauma, sepsis, malignancy, stroke, advanced age, heart or respiratory failure, previous VTE and pregnancy. Clinically undetected venous thrombosis may be present prior to ICU admission.

Other thrombotic risk factors may be acquired during the ICU stay, and include immobilization, pharmacologic paralysis, central venous lines, surgical procedures, sepsis, mechanical ventilation, vasopressor use and renal dialysis.

At the same time, critical care patients also frequently have risk factors for bleeding, including recent surgery, trauma, gastro intestinal (GI) bleeding, thrombocytopenia, and renal insufficiency. Up to 80% of critically ill patients have one or more episodes of bleeding, although most bleeding events are minor.

Therefore it is essential for all ICUs to develop a formal approach to thromboprophylaxis.

The selection of thromboprophylaxis for these heterogeneous group of patients involve a consideration of the risks of thromboembolism & bleeding , both of which may vary from day to day in the same ICU patient.

Scope of this guideline

Adults (18 years and older), admitted to critical care unit, including:

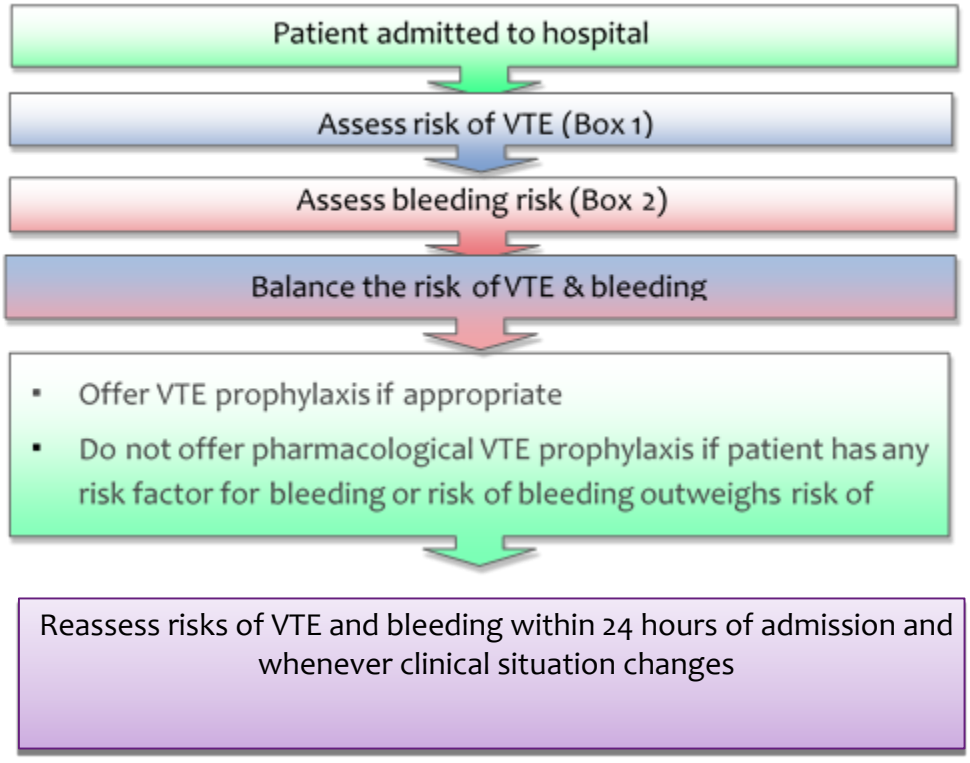
- Surgical patients
- Patients with acute medical illness
- Trauma patients
- Pregnant women

Definitions used in this document

- **Significantly reduced mobility** - Patients who are bed-bound, unable to walk unaided or likely to spend a substantial proportion of the day in bed or in a chair
- **Major bleeding** - 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** - An estimated glomerular filtration rate (eGFR) of less than 30 ml/min/1.73m^2 = chronic kidney disease (CKD) 4 or greater

The guideline assumes that prescribers will refer to product characteristics for guidance.

Care pathway



- Assess all patients on admission to the critical care unit for their risks of VTE (see box 1) and bleeding (see box 2).
- 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
- Review decisions about VTE prophylaxis for patients in critical care daily or 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.

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^2)
- One or more significant medical co-morbidities (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
- Women who are pregnant or have given birth within the previous 6 weeks

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 haemorrhagic stroke
- Thrombocytopenia (platelets less than 75×10^9/l)
- Uncontrolled systolic hypertension (230/120 mmHg or higher)
- Untreated inherited bleeding disorders (such as haemophilia and von Willebrand's disease)
- Active peptic ulceration

Priorities for implementation

1. Assessing the risks of VTE and bleeding
2. Reducing the risk of VTE
3. Patient information and planning for discharge

1.

Assessing the risks of VTE and bleeding

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

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

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

Assess all patients for risk of bleeding before offering pharmacological VTE prophylaxis.

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.

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

2.

Reducing the risk of VTE

Do not allow patients to become dehydrated unless clinically indicated.

Encourage patients to mobilise as early as possible.

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.

Using VTE prophylaxis

VTE prophylaxis can be

Mechanical

Pharmacological

Mechanical VTE prophylaxis

Base the choice of mechanical VTE prophylaxis on individual patient factors including clinical condition, surgical procedure and patient preference. Choose any one of:

A. Antiembolism stockings (thigh or knee length)
B. Foot impulse devices
C. Intermittent pneumatic compression devices (thigh or knee length)

Mechanical devices of thromboprophylaxis are contraindicated in

- Critical limb ischeamia
- Limb fractures
- Neuropathy (severe)
- Cellulitis of lower limb

A. **Antiembolism stockings**

Do not offer antiembolism 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 antiembolism stockings over venous ulcers or wounds

Ensure that patients who need antiembolism stockings have their legs measured and that the correct size of stocking is provided. Antiembolism stockings should be fitted and patients shown how to use them by staff trained in their use.

Ensure that patients who develop oedema or postoperative swelling have their legs remeasured and antiembolism stockings refitted.

If arterial disease is suspected, seek expert opinion before fitting antiembolism stockings.

Use antiembolism stockings that provide graduated compression and produce a calf pressure of 14–15 mmHg.
Encourage patients to wear their antiembolism stockings day and night until they no longer have significantly reduced mobility.

Remove antiembolism 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.

Discontinue the use of antiembolism 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.

When the patient is discharged from ICU and if still needs to be on antiembolism stocking, show them how to use antiembolism stockings correctly and ensure they understand that this will reduce their risk of developing VTE.

Monitor the use of antiembolism stockings and offer assistance if they are not being worn correctly.

B. Foot impulse devices

C. Intermittent pneumatic compression devices

Do not offer foot impulse or intermittent pneumatic compression devices to patients with a known allergy to the material of manufacture.

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

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

Choose any one of:

- Low molecular weight heparin (LMWH)
- Unfractionated heparin (UFH) (for patients with renal failure- Cr Cl < 30ml/min) or if risk of bleeding where rapid reversal may be required)
- Fondaparinux sodium (may continue if the patient is already on fondaparinux sodium at the time of admission)

Typical doses(fixed dosing)

- UFH - 5000 IU - 8 – 12 hourly subcutaneously (SC)
- LMWH
  - Enoxaparin sodium – 20-40mg once daily
  - Tinzaparin 50 IU/kg once daily SC (3500-4500 daily)
  - Dalteparin sodium – 2500-5000 IU once daily SC
- Fondaparinux – 2.5mg once daily SC

Weight adjusted dosing – advisable for the obese (BMI >30kg/m^2)

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

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 box 1)

Take into account the risk of bleeding (see box 2) and of co-morbidities 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

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

Do not offer additional pharmacological or mechanical VTE prophylaxis to patients who are having full anticoagulant therapy; for example, fondaparinux sodium, low molecular weight heparin (LMWH) or unfractionated heparin (UFH)

Considerations for different patient populations

Medical patients

I. General medical patients

Offer pharmacological VTE prophylaxis to general medical patients assessed to be at increased risk of VTE .

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

II. Patients with stroke

1. Do not offer anti-embolism stockings for VTE prophylaxis to patients who are admitted for stroke.
2. Consider offering prophylactic-dose LMWH or UFH if
   a. A diagnosis of haemorrhagic stroke has been excluded, and
   b. The risk of bleeding (haemorrhagic transformation of stroke or bleeding into another site) is assessed to be low, and
   c. The patient has one or more of: −
      i. Major restriction of mobility
      ii. Previous history of VTE
      iii. Dehydration
      iv. Comorbidities (such as malignant disease).
   d. Continue until the acute event is over and the patient's condition is stable.

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

III. Patients with cancer

1. Offer pharmacological VTE prophylaxis to patients with cancer who are assessed to be at increased risk of VTE.
2. 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.
3. Do not routinely offer pharmacological or mechanical VTE prophylaxis to patients with cancer having oncological treatment who are ambulant. ??

IV. Patients with central venous catheters

1. Do not routinely offer pharmacological or mechanical VTE prophylaxis to patients with central venous catheters who are ambulant.
2. Consider offering pharmacological VTE prophylaxis to patients with central venous catheters who are at increased risk of VTE.

V. Patients in palliative care

1. 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.
2. 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.
3. 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.

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

Consider offering mechanical VTE prophylaxis to medical patients in whom pharmacological VTE prophylaxis is contraindicated.

Surgical patients

A. All surgery

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.
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.
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.
4. If regional anaesthesia is used, plan the timing of pharmacological VTE prophylaxis to minimize 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.
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.

B. Cardiac,Gastrointestinal, gynaecological, thoracic and urological

1. Offer VTE prophylaxis to patients who are not having other anticoagulation therapy and are assessed to be at increased risk of VTE .
    a. Start mechanical VTE prophylaxis at admission.
    b. Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.

c. Add pharmacological VTE prophylaxis for patients who have a low risk of major bleeding, taking into account individual patient factors and according to clinical judgment.
d. Continue pharmacological VTE prophylaxis until the patient no longer has significantly reduced mobility (generally 5–7 days).

2. Extended pharmacological prophylaxis to 28 days post operatively for patients who have had major cancer surgery in abdomen or pelvis.

C. Neurological (cranial or spinal)

1. Offer VTE prophylaxis to patients undergoing cranial or spinal surgery who are assessed to be at increased risk of VTE
    a. Start mechanical VTE prophylaxis at admission.
    b. Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.
2. 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.

D. Orthopedic surgery –

1. Offer combined VTE prophylaxis with mechanical and pharmacological methods to patients undergoing orthopaedic surgery.
    a. Start mechanical VTE prophylaxis at admission.
    b. Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.
    c. Provided there are no contraindications, start pharmacological VTE prophylaxis after surgery. Choose any one of: –
        i. Low Molecular Weight Heparin, starting 6–12 hours after surgery
        ii. Unfractionated Heparin, starting 6–12 hours after surgery.

iii. Fondaparinux sodium*, starting 6 hours after surgical closure for hip & knee replacement surgery provided haemostasis has been established and there is no risk of bleeding (*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)

2. Continue pharmacological VTE prophylaxis for 28–35 days in hip replacement & hip fracture surgery and 10–14 days for knee replacement. For other orthopaedic surgeries, continue pharmacological VTE prophylaxis until the patient no longer has significantly reduced mobility.
3. Do not routinely offer VTE prophylaxis to patients undergoing upper limb surgery unless the patient is assessed to be at increased risk of VTE
4. **Lower limb plaster casts -** Consider offering pharmacological VTE prophylaxis to patients with lower limb plaster casts after evaluating the risks and benefits based on clinical evaluation. Offer LMWH or UFH until lower limb plaster cast removal.

I. Major trauma

1. Offer combined VTE prophylaxis with mechanical and pharmacological methods.
2. Regularly reassess the patient's risks of VTE and bleeding.
    a. Start mechanical VTE prophylaxis at admission or as early as clinically possible.
    b. Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.
    c. If the benefits of reducing the risk of VTE outweigh the risks of bleeding and the bleeding risk has been established as low, add pharmacological VTE prophylaxis.
    d. Continue pharmacological VTE prophylaxis until the patient no longer has significantly reduced mobility

J. Vascular

1. 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.
2. If peripheral arterial disease is present, seek expert opinion before fitting anti-embolism stockings. P
    a. Start mechanical VTE prophylaxis at admission.
    b. Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.
    c. Add pharmacological VTE prophylaxis for patients who have a low risk of major bleeding, taking into account individual patient factors and according to clinical judgment.
    d. Continue pharmacological VTE prophylaxis until the patient no longer has significantly reduced mobility (generally 5–7 days).

K. Day surgery

1. Offer VTE prophylaxis to patients undergoing day surgery who are assessed to be at increased risk of VTE
    a. Start mechanical VTE prophylaxis at admission.
    b. Continue mechanical VTE prophylaxis until the patient no longer has significantly reduced mobility.
    c. Add pharmacological VTE prophylaxis for patients who have a low risk of major bleeding, taking into account individual patient factors and according to clinical judgment.
    d. If the patient is expected to have significantly reduced mobility after discharge, continue pharmacological VTE prophylaxis, generally for 5–7 days.

Pregnancy and up to 6 weeks post partum

1. 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:
    a. Expected to have significantly reduced mobility for 3 or more days
    b. Active cancer or cancer treatment
    c. Age over 35 years
    d. Critical care admission
    e. Dehydration
    f. Excess blood loss or blood transfusion
    g. Known thrombophilias
    h. Obesity (pre-pregnancy or early pregnancy BMI over 30 kg/m2)
    i. One or more significant medical comorbidities (for example: heart disease; metabolic, endocrine or respiratory pathologies; acute infectious diseases; inflammatory conditions)
    j. Personal history or a first-degree relative with a history of VTE
    k. Pregnancy-related risk factor (such as ovarian hyperstimulation, hyperemesis gravidarum, multiple pregnancy or pre-eclampsia)
    l. Varicose veins with phlebitis
    m. (Refer to annexure- VTE risk assessment in pregnancy and post partum- Greentop 37a)
2. Consider offering combined prophylaxis with mechanical and pharmacological methods to women who are pregnant or have given birth within the previous 6 weeks who are undergoing surgery, including caesarean section.
3. 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

The dose in pregnancy and post partum- weight based dosing

LMWH- 50-75% or full treatment dose in situations eg- VTE with APLS or AT deficiency, recurrent VTE

Monitoring the effect

- Clinical review- a medical officer should review anticaogulant therapy daily

Management of over anticoagulation and bleeding

Anticoagulants in prophylactic doses usually do not carry a high risk of bleeding. However changes in pharmacology, incorrect dosing or drug interactions may lead to adverse effects

A medical officer should review anticoagulant therapy daily

If bleeding occurs should anticoagulant should be withheld.

Consult a haematologist regarding potential measures for management of bleeding

3
Patient information and planning for discharge

Patient information

Be aware that heparins are of animal origin and this may be of concern to some patients. 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.

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, antiembolism 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)

Planning for discharge

To prevent interruption of protection, specific thromboprophylaxis recommendations should be included in the patients' orders when they are transferred out from the ICU.

References

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