Guidelines for the Prevention of Thromboembolism in Adults

Instructions for use

Enoxaparin administration

1. Pick an area on the right or left side of the abdomen in a laying or sitting position, at least 2 inches from the navel and out toward the waist. Clean the injection site with sterile alcohol swab and let dry. Alternate injection sites between left and right sides.

2. Carefully remove the needle cap by firmly pulling it straight off the syringe and discard. If required, dose adjustment must be done prior to injection. Do not expel the air bubble from the syringe before the injection.

3. Gently pinch the cleansed area of the abdomen between your thumb and index finger to make a fold in the skin. Insert the full length of the needle at a 90˚ angle into the fold of the skin. Inject using standard technique, pushing the plunger to the bottom of the syringe.

4. Remove the needle from the injection site, keeping your finger on the plunger. To minimize bruising do not rub the injection site after completion of the injection.

5. Immediately dispose off the syringe in the nearest sharps collector.

Guidelines for prevention of thromboembolism
Risk Assessment Model

Proposed VTE RAM for surgical and medical patients

**Step 1:** Exposing risk factors associated with clinical setting

<table>
<thead>
<tr>
<th>Assign 1 Factor</th>
<th>Assign 2 Factors</th>
<th>Assign 3 Factors</th>
<th>Assign 4 Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor Surgery*</td>
<td>Major Surgery*</td>
<td>Myocardial infarction</td>
<td>Effective major lower extremity amputation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Congenital heart failure</td>
<td>Hip, pelvis or leg fracture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Severe wound infection</td>
<td>Stroke</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Control venous access</td>
<td>Multiple trauma</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Acute spinal cord injury</td>
</tr>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Acute spinal cord injury</td>
</tr>
</tbody>
</table>

*Operations in which the dissection is important or that last longer than 45 minutes, including laparoscopic procedures.

**Step 2:** Predisposing risk factors associated with patient

<table>
<thead>
<tr>
<th>Assign 1 Factor unless otherwise noted</th>
<th>MOLECULAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 41 to 60 years (1 factor)</td>
<td>Factor V deficiency/activated protein C resistance (3 factors)</td>
</tr>
<tr>
<td>History of DVT/PE (3 factors)</td>
<td>Anti- phospholipid antibodies (3 factors)</td>
</tr>
<tr>
<td>Pregnancy or postpartum (&lt; 1 month)</td>
<td>Proteins C and S deficiency (3 factors)</td>
</tr>
<tr>
<td>Varicosity of veins</td>
<td>DVT/profusive PE (3 factors)</td>
</tr>
<tr>
<td>Inflammatory bowel disease</td>
<td>Anti- phospholipid antibodies (3 factors)</td>
</tr>
<tr>
<td>Obesity (&gt;20% ideal body weight)</td>
<td>Lupus anticoagulant (3 factors)</td>
</tr>
<tr>
<td>Combined oral contraceptive/estrogen replacement therapy</td>
<td>Factor V deficiency/activated protein C resistance (3 factors)</td>
</tr>
</tbody>
</table>

Total additional predisposing risk factors score: .........................................................

**Step 3:** Total risk factors (exposing + predisposing):

**Step 4:** Recommended prophylactic regimens for each risk group

<table>
<thead>
<tr>
<th>Risk Group</th>
<th>Recommended Prophylaxis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low risk (1 Factor)</td>
<td>LMWH every 12h, IPC and GCS</td>
</tr>
<tr>
<td>Moderate risk (2-3 Factors)</td>
<td>LMWH, fondaparinux, LMWH and IPC, GCS and compression stockings, LMWH and IPC, GCS</td>
</tr>
<tr>
<td>High risk (4-5 Factors)</td>
<td>LMWH and IPC, fondaparinux, LMWH and IPC, GCS and compression stockings, LMWH and IPC, GCS</td>
</tr>
<tr>
<td>Highest risk (6 or more Factors)</td>
<td>LMWH and IPC, fondaparinux, LMWH and IPC, GCS and compression stockings, LMWH and IPC, GCS and compression stockings</td>
</tr>
</tbody>
</table>

Abbreviations: LMWH, low-molecular-weight heparin; IPC, intermittent pneumatic compression; GCS, graduated compression stockings.

Capri et al: effective risk stratification of surgical & non-surgical Patients for VTE. Seminar in hematology Vol 38. NO2, suppl 5, April 2001
Guidelines for prevention of thromboembolism

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Abbreviations

AIS Acute Ischemic Stroke
DUS Doppler Ultrasound
DVT Deep Venous Thrombosis
GCS Gradual Compression Stocking
HFS Hip Fracture Surgery
ICH Intra Cerebral Hematoma
IPC Intermittent Pneumatic Compression
LDUH Low Dose Unfractionated Heparin
LMWH Low Molecular Weight Heparin
PE Pulmonary Embolism
RCT Randomized Clinical Trials
SCI Spinal Cord Injury
TKA Total Knee Arthroplasty
THA Total Hip Arthroplasty
THR Total Hip Replacement
VKA Vitamin K Antagonist
VTE Venous Thrombo-Embolism
VFP Venous Foot Pump
guidelines for prevention of thromboembolism

1. Antithrombotic therapy for prevention of DVT and PE in Acute Ischemic Stroke (AIS)
2. DVT/PE prophylaxis in patients with intracerebral hematoma (ICH)
3. Anticoagulation for cerebral venous sinus thrombosis
4. VTE prophylaxis during pregnancy and postpartum
5. Describing the various regimens of UFH & LMWH
6. Risk factors for VTE in pregnancy
7. General recommendations
8. No prior VTE or thrombophilia
9. Prior VTE
10. Inherited thrombophilia with no previous venous thromboembolism

Enoxaparin dosing in special populations

For moderate and mild renal impairment:
- Moderate renal impairment: creatinine clearance 30-50 mL/min
- Mild renal impairment: creatinine clearance 50-80 mL/min

*No dose adjustment is recommended for these populations; however, all such patients should be observed carefully for signs and symptoms of bleeding.

For low-weight or obese patients:
- Low-weight women (<45 kg)
- Low-weight men (<57 kg)
- Obese men and women

† There are no recommendations for dose adjustments for these populations; however, low-weight patients should be observed carefully for signs and symptoms of bleeding.

Clinical pharmacology information
- Anti-Xa exposure after a non-weight-adjusted (prophylaxis) dose is 52% higher in low-weight women (<45 kg) and 27% higher in low-weight men (<57 kg)
- In obese men and women (BMI 30-48 kg/m2), anti-Xa exposure after weight-adjusted doses is marginally higher at steady state, while Amax is not increased.
Dear Colleagues,

It’s our pleasure to introduce these state-of-the-art guidelines for venous thrombo-embolism (VTE) prophylaxis, which is based on the most recently issued ACCP, IU, ASRA & RCOG guidelines.

Recent evidence indicates that VTE is a major health problem. The Agency for Healthcare Research and Quality ranked 79 patient safety interventions based on the strength of the evidence supporting more widespread implementation of these procedures. The highest ranked safety practice was the appropriate use of prophylaxis to prevent VTE in patients at risk. Despite all this evidence, the risk remains underestimated and its management is suboptimal.

With the help of VTE committee in our institute, we will try to cover the wide variety of topics including VTE prophylaxis for different types of patients (critically ill patients, general medical, surgical, Obstetric, etc…) in this booklet. Trying to cover important issues related to our daily practice and answer outstanding questions in VTE.

This protocol with other tool provided for all health care professionals in our institute, will help us to raise VTE awareness as well as increase prophylaxis rate, for the sake of our patients.

Finally we are very confident that by your help, cooperation & compliance to the guidelines, we will find this project “DVT Safety Zone” a very helpful, informative tool. We are sure that, this program will be reflected on a better care for our patients.

Best regards

VTE Committee members

### Enoxaparin dosing in patients with severe renal impairment

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dosage regimen</th>
</tr>
</thead>
<tbody>
<tr>
<td>DVT prophylaxis in: Abdominal surgery, Hip or knee-replacement surgery, Medical patients during acute illness</td>
<td>30 mg SC once a day</td>
</tr>
<tr>
<td>Prophylaxis of ischemic complications of UA/NSTEMI*</td>
<td>1 mg/kg SC once a day (when concurrently administered with aspirin)</td>
</tr>
<tr>
<td>Inpatients with acute DVT with or without PE</td>
<td>1 mg/kg SC once a day (in conjunction with warfarin sodium therapy)</td>
</tr>
<tr>
<td>Outpatients with acute DVT without PE</td>
<td>1 mg/kg SC once a day (in conjunction with warfarin sodium therapy)</td>
</tr>
</tbody>
</table>

*UA/NSTEMI=Unstable Angina and non-0-wave myocardial infarction.

**Cockcroft-Gault equation for estimating creatinine clearance**

**In men:**

\[
\text{Creatinine clearance} = \frac{(140 - \text{age}) \times \text{weight (kg)}}{72 \times \text{serum creatinine (mg/100 mL)}}
\]

**In women:**

\[
\text{Creatinine clearance} = \frac{(140 - \text{age}) \times \text{weight (kg)}}{72 \times \text{serum creatinine (mg/100 mL)}} \times 0.85
\]


Use of this equation and others like it may not always be as accurate as the actual measurement of creatinine clearance.
Table 2 – Rational for Thrombophylaxis in Hospitalized Patients

<table>
<thead>
<tr>
<th>Rational</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>High prevalence of VTE</td>
<td>DVT is common in many hospitalized patient groups and silent DVT and PE with atrial fibrillation or valvular heart disease often clinically silent. Some patients having physical examination or noninvasive testing are either not effective nor cost-effective.</td>
</tr>
<tr>
<td>Adverse consequences of unprevented VTE</td>
<td>Costs of investigating symptomatic patients, especially bleeding.</td>
</tr>
<tr>
<td>Efficacy and effectiveness of prophylaxis</td>
<td>Thromboprophylaxis is highly effective at preventing symptomatic VTE and fatal PE. The prevention of DVT also prevents PE. Cost-effectiveness of prophylaxis has repeatedly been demonstrated.</td>
</tr>
</tbody>
</table>


3.2 The recommendations of the 7th ACCP conference on Antithrombotic and thrombolytic therapy.

Guidelines for prevention of thromboembolism

General recommendations

• All hospitalized patients should be assessed for their risk of venous thromboembolic disease and considered for prophylaxis.
• Early ambulation should be considered for all patients as soon as the clinical condition permits.
• We recommend that mechanical methods of prophylaxis be used primarily in patients who are at high risk of bleeding (Grade 1C+) or as an adjunct to anticoagulant-based prophylaxis (Grade 2A). We recommend that careful attention be directed toward ensuring the proper use of, and optimal compliance with, the mechanical device (Grade 1C+).
• We recommend against the use of aspirin alone as prophylaxis against VTE for any patient group (Grade 1A).
• For each of the antithrombotic agents, we recommend that clinicians consider the manufacturer’s suggested dosing guidelines (Grade 1C).

References

1-These guidelines are based for most part on the recommendations of the 7th ACCP Conference on Anti-thrombotic and thrombolytic therapy.


2-The guidelines for VTE prophylaxis with neuroaxial anesthesia are based on the above document in addition to The Second ASRA Consensus Conference on Neuroaxial Anesthesia and anticoagulation.


3-The guidelines for VTE prophylaxis during pregnancy and postpartum is based on:

3.1 The recommendations of the Royal College of Obstetricians and Gynecologists Thromboprophylaxis During Pregnancy, Labor, and After Vaginal Delivery.
• We recommend consideration of renal impairment when deciding on doses of LMWH, fondaparinux, the direct thrombin inhibitors, and other antithrombotic drugs that are cleared by the kidneys, particularly in elderly patients and those who are at high risk for bleeding. (Grade 1C+).

(Refer to page 51 for dose adjustment)

• In all patients undergoing neuraxial anesthesia or analgesia, we recommend special caution when using anticoagulant prophylaxis (Grade 1C).

• For patients at both extreme body weight, dose should be adjusted according to the manufacturer’s guidelines.

• With the exception of VTE prophylaxis during pregnancy, there is no need for laboratory monitoring for patients receiving VTE prophylaxis.

Patient on fondaparinux

Current ACCP guideline recommended that Fondaparinux should not be administered along with continuous epidural anesthesia because of lack of data on its safety.

Because of the unpredictable anticoagulant effect of the anticoagulant.

All patients should be monitored carefully and frequently for the symptoms and signs of cord compression.

These symptoms include progression of lower extremity numbness or weakness, bowel or bladder dysfunction, and new onset of back pain. If spinal hematoma is suspected, diagnostic imaging and definitive surgical therapy must be performed rapidly to reduce the risk of permanent paresis.
Guidelines for prevention of thromboembolism

Grading recommendation

**Grade 1**
If the guideline developers are very certain that benefits do, or do not, outweigh risks, burdens, and costs, they will make a strong recommendation.

**Grade 2**
If they are less certain of the magnitude of the benefits and the risks, burdens, and costs, and thus of their relative impact, they make a weaker recommendation.

**Grade A**
Consistent results from RCTs

**Grade C+**
Observational studies with very strong effects or secure generalizations from randomized clinical trials (RCTs).

**Grade B**
Inconsistent results from RCTs

**Grade C**
Observational studies

We now use the language “**we recommend**” for strong recommendations (ie, Grades 1A, 1C+, 1B, and 1C) and “**we suggest**” for weaker recommendations (ie, Grades 2A, 2C+, 2B, and 2C).

- Warfarin should be stopped if INR > 3 in a patient with an indwelling epidural catheter.

- It is recommended that epidural analgesia should not be used for longer than 1 or 2 days because of the unpredictable anticoagulant effect of the anticoagulant.
**VTE risk factors**

Table 3 – Risk Factors for VTE

<table>
<thead>
<tr>
<th>Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trauma (major or lower extremity)</td>
</tr>
<tr>
<td>Immobility, paresis</td>
</tr>
<tr>
<td>Malignancy</td>
</tr>
<tr>
<td>Cancer therapy (hormonal, chemotherapy, or radiotherapy)</td>
</tr>
<tr>
<td>Previous VTE</td>
</tr>
<tr>
<td>Increasing age</td>
</tr>
<tr>
<td>Pregnancy and the postpartum period</td>
</tr>
<tr>
<td>Estrogen-containing oral contraception or (HRT)</td>
</tr>
<tr>
<td>Selective estrogen receptor modulators</td>
</tr>
<tr>
<td>Acute medical illness</td>
</tr>
<tr>
<td>Heart or respiratory failure</td>
</tr>
<tr>
<td>Inflammatory bowel disease</td>
</tr>
<tr>
<td>Nephritic syndrome</td>
</tr>
<tr>
<td>Myeloproliferative disorders</td>
</tr>
<tr>
<td>Paroxysmal nocturnal hemoglobinuria</td>
</tr>
<tr>
<td>Obesity</td>
</tr>
<tr>
<td>Smoking</td>
</tr>
<tr>
<td>Varicose veins</td>
</tr>
<tr>
<td>Central venous catheterization</td>
</tr>
<tr>
<td>Inherited or acquired thrombophilia</td>
</tr>
</tbody>
</table>

**Patients on VKA (oral anticoagulant)**

- In patients on chronic Warfarin therapy, anticoagulant should be stopped (ideally 4-5 days) prior to the neuroaxial anaesthesia and INR should be measured.

- In patients receiving an initial dose of Warfarin prior to surgery, INR should be checked prior to the procedure if the first dose was given more than 24 hours earlier.

- In patients receiving low-dose Warfarin (≤ 5mg daily) therapy during epidural analgesia, INR should be checked on a daily basis and checked before catheter removal.

- Before removal of the epidural catheter, INR must be documented to be < 1.5.

- Neurologic testing of sensory and motor function should be performed routinely for patients on Warfarin therapy and at least for 24 hours after catheter removal if the INR was > 1.5 at the time of removal.

*NB:* Please refer to Page 55 for “VTE Risk Assessment Model” RAM for medical & surgical patients, in order to have a guide in stratifying your patients at risk of developing DVT or PE (ie, very high, high, moderate, or low risk).
Guidelines for prevention of thromboembolism

General surgery

- **In low-risk general surgery patients**
  Who are undergoing a minor procedure, are <40 years of age, and have no additional risk factors.
  we recommend against the use of specific prophylaxis other than early and persistent mobilization (Grade 1C).

- **Moderate-risk general surgery patients**
  Are those patients undergoing a non major procedure and are between the ages of 40 and 60 years, Or have additional risk factors.
  Patients who are undergoing major operations and are <40 years of age with no additional risk factors.
  We recommend prophylaxis with LMWH, e.g. Enoxaparin 20 mg once daily LDUH, 5,000 U bid (both Grade 1A).

- **Higher-risk general surgery patients**
  Are those undergoing non major surgery and are > 60 years of age or have additional risk factors.
  Patients undergoing major surgery who are >40 years of age or have additional risk factors.
  We recommend thromboprophylaxis with LMWH, e.g. Enoxaparin 40 mg once daily or LDUH, 5,000 U tid (both Grade 1A).

Neuroaxial anesthesia/analgesia in patients receiving VTE prophylaxis

**Patients receiving subcutaneous LDUH or LMWH**

- Needle insertion should be delayed at least 8 - 12 hours after the subcutaneous dose of LDUH or the twice-daily prophylactic dose of LMWH, or at least 18 hours after a once daily LMWH injection.

- Anticoagulant prophylaxis should be delayed if a hemorrhagic aspirate (i.e bloody tap) is encountered during the initial spinal needle insertion.

- Removal of an epidural catheter should be done when the anticoagulant effect is at minimum (usually just before the next schedules dose).

- Anticoagulant prophylaxis should be delayed at least 2 hours after spinal needle or epidural catheter removal

- Indwelling catheters can successfully be maintained while on LDUH or LMWH prophylaxis.
• **High-risk general surgery patients with multiple Risk factors**

We recommend that pharmacologic methods (LMWH ie, Enoxaparin 40 mg once daily or LDUH, tid) be Combined with the use of GCS and/or IPC (Grade 1C+).

• **In general surgery patients with a high risk of Bleeding**

We recommend the use of mechanical prophylaxis with properly fitted GCS or IPC, at least initially until the bleeding risk decreases (Grade 1A).

• **In selected high-risk general surgery patients**

Including those who have undergone major cancer surgery.

We suggest post-hospital discharge prophylaxis with LMWH (Enoxaparin 40 mg once daily) (Grade 2A).

**N.B:**

Please refer to the VTE RAM "risk Assessment Model", in order to have a better tool to assess the level of risk for your patient, which is a function of exposing (associated with clinical settings) & predisposing (associated with patient) risk factors.

---

**Inherited thrombophilia with no previous venous thromboembolism**

• **In antithrombin-deficient women, compound heterozygotes for prothrombin G20210A and factor V Leiden, and homozygotes for these condition with no prior VTE**

Active prophylaxis is recommended.

• **In all other patients with no prior VTE and Thrombophilia (confirmed laboratory abnormality)**

Surveillance or prophylactic LMWH or minidose unfractionated heparin (UH), plus postpartum anticoagulant is recommended.
In patients undergoing vascular surgery who do not have additional thromboembolic risk factors

We suggest that clinicians not routinely use thromboprophylaxis (Grade 2B).

For patients undergoing major vascular surgical procedures who have additional thromboembolic risk factors,

We recommend prophylaxis with LDUH or LMWH (e.g. Enoxaparin 40 mg) (Grade 1C+).

N.B. Please refer to the VTE RAM "risk Assessment Model", in order to have a better tool to assess the level of risk for your patient, which is a function of exposing (associated with clinical settings) & predisposing (associated with patient) risk factors.

Exenaparin to be started 1-2 hrs pre-operative

In patients with multiple (two or more) episodes of VTE and/or women receiving long-term anticoagulants

The recommended prophylaxis regimen is:
- Adjusted-dose UFH
- or adjusted-dose LMWH
Followed by resumption of long-term anticoagulants after delivery

In all women with pervious DVT

Antenatally and postpartum, the added use of graduated elastic compression stocking is recommended.
**Gynecologic surgery**

- **For gynecologic surgery patients undergoing brief procedures of \(\leq 30\) min for benign disease**
  
  We recommend against the use of specific prophylaxis other than early and persistent mobilization (Grade 1C+).

- **For patients undergoing laparoscopic gynecologic procedures, in whom additional VTE risk factors are present**
  
  We recommend the use of thromboprophylaxis with one or more of the following: LDUH, LMWH, IPC, or GCS (all Grade 1C).

- **For patients undergoing major gynecologic surgery for benign disease, without additional risk factors,**
  
  We recommend LDUH, 5,000 U bid (Grade 1A). Alternatives include once-daily prophylaxis with LMWH e.g. Enoxaparin 40 mg (Grade 1C+), or IPC started just before surgery and used continuously while the patient is not ambulating. (Grade 1B).

- **For patients undergoing extensive surgery for malignancy, and for patients with additional VTE risk factors**

- **In patients with a single episode of VTE and Thrombophilia (confirmed laboratory abnormality) or a strong family history of thrombosis and not receiving long – term anticoagulants**

  One of the following regimens is recommended:
  - prophylactic or intermediate dose LMWH
  - Minidose or moderate-dose UFH, plus postpartum anticoagulant

- **In antithrombin-deficient women, compound heterozygotes for prothrombin G20210A and factor V Leiden and homozygotes for these condition with a history of VTE**

  We recommend:
  - Intermediate – dose LMWH prophylaxis
  - Or moderate – dose UFH
We recommend routine prophylaxis with LDUH, 5,000 U tid (Grade 1A), or higher doses of LMWH (e.g. Enoxaparin 40 mg) [Grade 1A]. Alternative considerations include IPC alone continued until hospital discharge (Grade 1A), or a combination of LDUH or LMWH plus mechanical prophylaxis with GCS or IPC (all Grade 1C).

• For patients undergoing major gynecologic procedures

We suggest that prophylaxis continue until discharge from the hospital (Grade 1C).

• For patients who are at particularly high risk, including those who have undergone cancer surgery and are > 60 years of age or have previously experienced VTE

We suggest continuing prophylaxis for 2 to 4 weeks after hospital discharge (Grade 2C).

N.B: Please refer to the VTE RAM "risk Assessment Model", in order to have a better tool to assess the level of risk for your patient, which is a function of exposing (associated with clinical settings) & predisposing (associated with patient) risk factors.

Please refer to medical patients section for medical setting.
Urologic surgery

- **In patients undergoing transurethral or other Low-risk urologic procedures**
  
  We recommend **against** the use of specific prophylaxis other than early and persistent mobilization (**Grade 1C+**).

- **For patients undergoing major, open urologic Procedures**
  
  We recommend routine prophylaxis with LDUH twice daily or three times daily (**Grade 1A**). Acceptable alternatives include prophylaxis with IPC and/or GCS (**Grade 1B**) or LMWH (**Grade 1C+**).

- **For urologic surgery patients who are actively bleeding, or are at very high risk for bleeding**
  
  we recommend the use of mechanical prophylaxis with GCS and/or IPC at least until the bleeding risk decreases (**Grade 1C+**).

- **For patients with multiple risk factors**
  
  We recommend combining GCS and/or IPC with LDUH or LMWH (**Grade 1C+**).

No prior VTE or thrombophilia

- **Women with three or more persisting risk factors**
  
  Should be considered for thromboprophylaxis with LMWH antenatally and for three to five days postpartum.

- **Women should be assessed before or during labour for risk factors for VTE**
  
  Age over 35 years and BMI greater than 30 kg/cm², body weight greater than 90 kg are important independent risk factor for postpartum VTE even after vaginal delivery. The combination of either of these risk factors with any other risk factor for VTE (such as pre-eclampsia or immobility) or the presence of two other persisting risk factors

  Should lead the clinicians to consider the use of LMWH for three to five days.
Guidelines for prevention of thromboembolism

**General recommendation**

- All women should undergo an assessment of risk factors for VTE in early pregnancy or before pregnancy. This assessment should be repeated if the women is admitted to hospital or develop other intercurrent problems.

- Women with previous VTE should be screened for inherited and acquired Thrombophilia, ideally before pregnancy.

- Regardless of their risk of VTE, immobilization of women during pregnancy, labour and the puerperium should be minimized and dehydration should be avoided.

**Laparoscopic surgery**

- We recommend against routine thromboprophylaxis in these patients, other than aggressive mobilization (Grade 1A).

- For patients undergoing laparoscopic procedures, and who have additional thromboembolic risk factors

  We recommend the use of thromboprophylaxis with one or more of the following: LDUH, LMWH, IPC, or GCS (Grade 1C+).

*N.B.*: Please refer to the VTE RAM "risk Assessment Model", in order to have a better tool to assess the level of risk for your patient, which is a function of exposing (associated with clinical settings) & predisposing (associated with patient) risk factors.
Orthopaedic surgery

Elective hip arthroplasty

- For patients undergoing elective THR
  We recommend the routine use of one of the following three anticoagulants:
  1. LMWH (at a usual high-risk dose Enoxaparin 40 mg once daily, started 12 h before surgery or 12 to 24 h after surgery, or 4 to 6 h after surgery at half the usual high-risk dose and then increasing to the usual high-risk dose the following day).
  2. fondaparinux (2.5 mg started 6 to 8 h after surgery).
  or 3. adjusted-dose VKA started preoperatively or the evening after surgery (INR target, 2.5; INR range, 2.0 to 3.0)

[All Grade 1A]

Underlying values and preferences. We have not recommended the use of fondaparinux over LMWH and VKA, or the use of LMWH over VKA, because we place a relatively low value on the prevention of venographic thrombosis, and a relatively high value on minimizing bleeding complications.

- We recommend **against** the use of aspirin, dextran, LDUH, GCS, IPC, or VFP as the only method of thromboprophylaxis in these patients **(Grade 1A)**.

New onset or transient

- Surgical procedure in pregnancy or puerperium, e.g. evacuation of retained products of conception, postpartum sterilization.
- Ovarian hyperstimulation syndrome.
- Severe infection, e.g. pyelonephritis.
- Midcavity instrumental delivery.
- Immobility (> 4 days bed rest).
- Immobility after delivery.
- Excessive blood loss.
- Prolonged labour.
- Long-haul travel.
- Pre-eclampsia.
- Hyperemesis.
- Dehydration.
Elective knee arthroplasty

For patients undergoing elective TKA we recommend routine thromboprophylaxis using LMWH (at the usual high-risk dose e.g. Enoxaparin 40 mg once daily), fondaparinux, or adjusted-dose VKA (target INR, 2.5; INR range, 2.0 to 3.0) [all Grade 1A].

Underlying values and preferences. We have not recommended the use of fondaparinux over LMWH and VKA, or the use of LMWH over VKA, because we place a relatively low value on the prevention of venographic thrombosis, and a relatively high value on minimizing bleeding complications.

- The optimal use of IPC is an alternative option to anticoagulant prophylaxis (Grade 1B).
- We recommend against the use of any of the following as sole methods of thromboprophylaxis: aspirin (Grade 1A); LDUH (Grade 1A); or VFP (Grade 1B).

Risk factors for venous thromboembolism in pregnancy

- Age over 35 years
- Immobility
- Obesity
- Operative delivery
- Pre-eclampsia
- Parity greater than 4
- Surgical procedure in pregnancy or puerperium, e.g. postpartum sterilization
- Previous DVT
- Thrombophilia
  - congenital: antithrombin deficiency
    - protein C deficiency
    - protein S deficiency
    - factor V Leiden
    - prothrombin gene variant
  - acquired: lupus anticoagulant
    - anticardiolipin antibodies
- Excessive blood loss
- Paraplegia
- Sickle cell disease
- Inflammatory disorders and infection, e.g. inflammatory bowel disease and urinary tract infection
- Dehydration
Knee arthroscopy

- We suggest clinicians do not use routine thromboprophylaxis in these patients, other than early mobilization (Grade 2B).

- For patients undergoing arthroscopic knee surgery who are at higher than usual risk, based on preexisting VTE risk factors or following a prolonged or complicated procedure,

  We suggest thromboprophylaxis with LMWH (Grade 2B).

**N.B:**

Please refer to the VTE RAM "risk Assessment Model", in order to have a better tool to assess the level of risk for your patient, which is a function of exposing (associated with clinical settings) & predisposing (associated with patient) risk factors.

**Adjusted-dose LMWH:**

Weight-adjusted, full-treatment doses of LMWH administered once or twice daily (e.g. Enoxaparin 1mg/kg q12h, dalteparin 100 U/kg q12h, Tinzaparin 175 U/kg od or 200 U/kg od).

As the half-life of LMWH is shorter in pregnancy, twice daily dosing is preferable, at least in the initial treatment phase.

**Postpartum anticoagulants:**

Warfarin for 4 to 6 weeks with a target INR of 2.0 to 3.0, with initial UFH or LMWH overlap until the INR is ≥ 2.0.

**In addition, the term surveillance**

Refers to clinical vigilance and aggressive investigation of women with symptoms suspicious of DVT or PE.
VTE prophylaxis during pregnancy and postpartum

When describing the various regimens of UFH and LMWH, we will use the following short forms:

- **Minidose UFH**: UFH 5,000 U SC q12h
- **Moderate-dose UFH**: UFH SC q12h in doses adjusted to target an anti-Xa level of 0.1 to 0.3 U/mL.
- **Adjusted-dose UFH**: UFH SC q12h in doses adjusted to target a mid-interval aPTT into the therapeutic range.
- **Prophylactic LMWH**: e.g. Enoxaparin 40 mg SC q24 h or dalteparin 5,000 U SC q24h, (although at extremes of body weight modification of dose may be required).
- **Intermediate-dose LMWH**: e.g. Enoxaparin 40 mg SC q12h or dalteparin 5,000 U SC q12h.

**Hip fracture surgery**

- **For patients undergoing HFS**

  We recommend the routine use of fondaparinux (Grade 1A), LMWH at the usual high-risk dose e.g. Enoxaparin 40 mg once daily (Grade 1C+), adjusted-dose VKA [target INR, 2.5; INR range, 2.0 to 3.0] (Grade 2B), or LDUH (Grade 1B).

- **We recommend against** the use of aspirin alone (Grade 1A).

- **If surgery will likely be delayed**

  We recommend that prophylaxis with either LDUH or LMWH be initiated during the time between hospital admission and surgery (Grade 1C+).

- **If anticoagulant prophylaxis is contraindicated because of a high risk of bleeding**

  We recommend mechanical prophylaxis (Grade 1C+).
Other prophylaxis issues in major orthopedic surgery

Timing of prophylaxis initiation

For major orthopedic surgical procedures, we recommend that a decision about the timing of the initiation of pharmacologic prophylaxis be based on the efficacy-to-bleeding tradeoffs for that particular agent (Grade 1A).

For LMWH, there are only small differences between starting preoperatively or postoperatively, and both options are acceptable (Grade 1A).

Pre-hospital discharge screening for DVT

We recommend against the routine use of DUS screening at the time of hospital discharge in asymptomatic patients following major orthopedic surgery (Grade 1A).

Underlying values and preferences:
The recommendation for subcutaneous heparin assumes a relatively low degree of risk aversion.

Anticoagulation for cerebral venous sinus Thrombosis

- In patients with venous sinus thrombosis

We recommend that clinicians use:
- Unfractionated heparin (Grade 1B)
- Low molecular weight heparin (Grade 1B)

Over no anticoagulant therapy during the acute phase, even in the presence of hemorrhagic infarction. In these patients.

We recommend oral anticoagulation for 3 to 6 months (target INR, 2.5; range, 2.0 to 3.0) [Grade 1C].
Guidelines for prevention of thromboembolism

**Duration of prophylaxis**

- **We recommend that patients undergoing THR, TKA, or HFS**
  
  Receive thromboprophylaxis with LMWH (e.g. using a high-risk dose Enoxaparin 40 mg once daily), fondaparinux (2.5 mg daily), or a VKA (target INR, 2.5; INR range, 2.0 to 3.0) for at least 10 days (Grade 1A).

- **We recommend that patients undergoing THR or HFS**
  
  Be given extended prophylaxis for up to 28 to 35 days after surgery (Grade 1A).

The recommended options for THR include:
- LMWH (Grade 1A)
- VKA (Grade 1A)
- Fondaparinux (Grade 1C+).

The recommended options following HFS are:
- Fondaparinux (Grade 1A)
- LMWH (Grade 1C+)
- VKA (Grade 1C+)

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**Stroke**

**Antithrombotic therapy for prevention of DVT and PE in AIS**

- **For acute stroke patients with restricted mobility**
  
  We recommend prophylactic LDUH or LMWH or heparinoids (Grade 1A).

- **For patients who have contraindications to anticoagulants**
  
  We recommend use of intermittent pneumatic compression devices or elastic stockings (Grade 1C)

**DVT/PE Prophylaxis in Patients with Intracerebral Hematoma (ICH)**

- **In patients with an acute ICH**
  
  We recommend the initial use intermittent pneumatic compression (Grade 1C+). In stable patients, we suggest LDUH may be initiated as soon as the second day after the onset of the hemorrhage (Grade 2C).
Elective spine surgery

- For spinal surgery patients with no additional risk factors
  We recommend against the routine use of any thromboprophylaxis modality, apart from early and persistent mobilization (Grade 1C).

- In patients undergoing spinal surgery, who exhibit additional risk factors, such as advanced age, known malignancy, presence of a neurologic deficit, previous VTE, or an anterior surgical approach
  We recommend that some form of prophylaxis be used (Grade 1B)

- For patients with additional risk factors
  We recommend any of the following prophylaxis options:
  - postoperative LDUH alone (Grade 1C+)
  - postoperative LMWH alone (Grade 1B)
  - perioperative IPC alone (Grade 1B)
  - Other considerations include perioperative GCS alone (Grade 2B)
  - perioperative IPC combined with GCS (Grade 2C).

In patients with multiple risk factors for VTE, we recommend combining LDUH or LMWH with GCS and/or IPC (Grade 1C+).

Long distance travel

- We recommend the following general measures for long-distance travelers (ie, flights of >6 h duration):
  Avoidance of constrictive clothing around the lower extremities or waist; avoidance of dehydration and frequent calf muscle stretching (Grade 1C).

- For long-distance travelers with additional risk factors for VTE
  We recommend the general strategies listed above. If active prophylaxis is considered, because of the perceived increased risk of venous thrombosis, we suggest the use of:
  - Properly fitted, below-knee GCS, providing 15 to 30 mm Hg of pressure at the ankle (Grade 2B).
  - A single prophylactic dose of LMWH, injected prior to departure (Grade 2B).

- We recommend against the use of aspirin for VTE prevention associated with travel (Grade 1B).
**Guidelines for prevention of thromboembolism**

**Neurosurgery**

- We recommend that thromboprophylaxis be routinely used in patients undergoing major neurosurgery *(Grade 1A).*

- We recommend the use of IPC with or without GCS in patients undergoing intracranial neurosurgery *(Grade 1A).*

- Acceptable alternatives to the above options are prophylaxis with LDUH *(Grade 2B)* or postoperative LMWH (Enoxaparin 40 mg) *(Grade 2A).*

- We suggest the combination of mechanical prophylaxis (ie, GCS and/or IPC) and pharmacologic prophylaxis (ie, LDUH or LMWH) in high-risk neurosurgery patients *(Grade 2B).*

**Critical care**

- **On admission to a critical care unit**
  We recommend that all patients be assessed for their risk of VTE. Accordingly, most patients should receive thromboprophylaxis *(Grade 1A).*

- **For patients who are at high risk for bleeding**
  We recommend mechanical prophylaxis with GCS and/or IPC until the bleeding risk decreases *(Grade 1C+)*.

- **For ICU patients who are at moderate risk for VTE (eg, medically ill or postoperative patients)**
  We recommend using LDUH or LMWH (e.g., Enoxaparin 40 mg, od) prophylaxis *(Grade 1A).*

- **For patients who are at higher risk such as that following major trauma or orthopedic surgery**
  We recommend LMWH prophylaxis *(Grade 1A).*
Guidelines for prevention of thromboembolism

**Trauma**

- We recommend that all trauma patients with at least one risk factor for VTE receive thromboprophylaxis, if possible (Grade 1A).

- In the absence of a major contraindication We recommend that clinicians use LMWH (Enoxaparin 30 mg, bid) prophylaxis starting as soon as it is considered safe to do so (Grade 1A).

- If LMWH prophylaxis is delayed or if it is currently contraindicated due to active bleeding or a high risk for hemorrhage We recommend that mechanical prophylaxis with IPC, or possibly with GCS alone, be (Grade 1B).

- In patients who are at high risk for VTE (eg, in the presence of a SCI, lower extremity or pelvic fracture, major head injury, or an indwelling femoral venous line) and who have received suboptimal prophylaxis or no prophylaxis We recommend DUS screening (Grade 1C).

**Cancer patients**

- We recommend that cancer patients undergoing surgical procedures receive prophylaxis that is appropriate for their current risk state (Grade 1A)

  Refer to the recommendations in the relevant surgical subsections.

- We recommend that hospitalized cancer patients who are bedridden with an acute medical illness receive prophylaxis that is appropriate for their current risk state (Grade 1A).

  Refer to the recommendations in the section dealing with medical patients.

- We suggest that clinicians not routinely use prophylaxis to try to prevent thrombosis related to long term indwelling CVCs in cancer patients (Grade 2B). Specifically, we suggest that clinicians not use LMWH (Grade 2B), and we recommend against the use of fixed-dose warfarin (Grade 1B) for this indication.
Guidelines for prevention of thromboembolism

**Medical conditions**

- In acutely ill medical patients who have been admitted to the hospital with congestive heart failure or severe respiratory disease, or who are confined to bed and have one or more additional risk factors, including active cancer, previous VTE, sepsis, acute neurologic disease, or inflammatory bowel disease, we recommend prophylaxis with LMWH (e.g. Enoxaparin 40 mg, od) *(Grade 1A)* or LDUH *(Grade 1A)*.

- In medical patients with risk factors for VTE, and in whom there is a contraindication to anticoagulant prophylaxis, we recommend the use of mechanical prophylaxis with GCS or IPC *(Grade 1C+)*.

**N.B:**
Please refer to the VTE RAM "risk Assessment Model", in order to have a better tool to assess the level of risk for your patient, which is a function of **exposing** (associated with clinical settings) & **predisposing** (associated with patient) **risk factors**.

- We recommend against the use of IVCFs as primary prophylaxis in trauma patients *(Grade 1C)*.

- We recommend the continuation of thromboprophylaxis until hospital discharge, including the period of inpatient rehabilitation *(Grade 1C+)*.

- We suggest continuing prophylaxis after hospital discharge

  With LMWH (Enoxaparin 40 mg, od) or a VKA (target INR, 2.5; INR range, 2.0 to 3.0) in patients with major impaired mobility *(Grade 2C)*.
Guidelines for prevention of thromboembolism

**Acute SCI**

- We recommend that thromboprophylaxis be provided for all patients with acute SCIs (Grade 1A).
- We recommend against the use of LDUH, GCS, or IPC as single prophylaxis modalities (Grade 1A).
- In patients with acute SCI
  We recommend prophylaxis with LMWH (e.g. Enoxaparin 30 mg, bid), to be commenced once primary hemostasis is evident (Grade 1B). We suggest the combined use of IPC and either LDUH (Grade 2B) or LWMH (Grade 2C) as alternatives to LMWH.
- When anticoagulant prophylaxis is contraindicated early after injury
  We recommend the use of IPC and/or GCS (Grade 1C+).
- We recommend against the use of an IVCF as primary prophylaxis against PE (Grade 1C).
- During the rehabilitation phase following acute SCI, we recommend the continuation of LMWH (e.g. Enoxaparin 40 mg, od) prophylaxis or conversion to an oral VKA (INR target, 2.5; INR range, 2.0 to 3.0) [Grade 1C].

**Burns**

- Burn patients with additional risk factors for VTE, including one or more of the following: advanced age, morbid obesity, extensive or lower extremity burns, concomitant lower extremity trauma, use of a femoral venous catheter, and/or prolonged immobility
  We recommend that those patients receive thromboprophylaxis, if possible (Grade 1C+).
- If there are no contraindications
  we recommend the use of either LDUH or LMWH, starting as soon as it is considered safe to do so (Grade 1C+).

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*NB:* Please refer to the VTE RAM "risk Assessment Model", in order to have a better tool to assess the level of risk for your patient, which is a function of exposing (associated with clinical settings) & predisposing (associated with patient) risk factors.
### Acute SCI

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- We recommend against the use of LDUH, GCS, or IPC as single prophylaxis modalities (Grade 1A).
- In patients with acute SCI
  - We recommend prophylaxis with LMWH (e.g. Enoxaparin 30 mg, bid), to be commenced once primary hemostasis is evident (Grade 1B). We suggest the combined use of IPC and either LDUH (Grade 2B) or LWMH (Grade 2C) as alternatives to LMWH.
- When anticoagulant prophylaxis is contraindicated early after injury
  - We recommend the use of IPC and/or GCS (Grade 1C+).
- We recommend against the use of an IVCF as primary prophylaxis against PE (Grade 1C).
- During the rehabilitation phase following acute SCI, we recommend the continuation of LMWH (e.g. Enoxaparin 40 mg, od) prophylaxis or conversion to an oral VKA (INR target, 2.5; INR range, 2.0 to 3.0) (Grade 1C).

### Burns

- Burn patients with additional risk factors for VTE, including one or more of the following: advanced age, morbid obesity, extensive or lower extremity burns, concomitant lower extremity trauma, use of a femoral venous catheter, and/or prolonged immobility
  - We recommend that those patients receive thromboprophylaxis, if possible (Grade 1C+).
- If there are no contraindications
  - we recommend the use of either LDUH or LMWH, starting as soon as it is considered safe to do so (Grade 1C+).
Medical conditions

- In acutely ill medical patients who have been admitted to the hospital with congestive heart failure or severe respiratory disease, or who are confined to bed and have one or more additional risk factors, including active cancer, previous VTE, sepsis, acute neurologic disease, or inflammatory bowel disease, we recommend prophylaxis with LMWH (e.g. Enoxaparin 40 mg, od) (Grade 1A) or LDUH (Grade 1A).

- In medical patients with risk factors for VTE, and in whom there is a contraindication to anticoagulant prophylaxis, we recommend the use of mechanical prophylaxis with GCS or IPC (Grade 1C+).

We recommend against the use of IVCFs as primary prophylaxis in trauma patients (Grade 1C).

We recommend the continuation of thromboprophylaxis until hospital discharge, including the period of inpatient rehabilitation (Grade 1C+)

We suggest continuing prophylaxis after hospital discharge

With LMWH (Enoxaparin 40 mg, od) or a VKA (target INR, 2.5; INR range, 2.0 to 3.0) in patients with major impaired mobility (Grade 2C).

N.B: Please refer to the VTE RAM "risk Assessment Model", in order to have a better tool to assess the level of risk for your patient, which is a function of exposing (associated with clinical settings) & predisposing (associated with patient) risk factors.
Trauma

- We recommend that all trauma patients with at least one risk factor for VTE receive thromboprophylaxis, if possible (Grade 1A).

- In the absence of a major contraindication
  
  We recommend that clinicians use LMWH (Enoxaparin 30 mg, bid) prophylaxis starting as soon as it is considered safe to do so (Grade 1A).

- If LMWH prophylaxis is delayed or if it is currently contraindicated due to active bleeding or a high risk for hemorrhage
  
  We recommend that mechanical prophylaxis with IPC, or possibly with GCS alone, be (Grade 1B).

- In patients who are at high risk for VTE (e.g., in the presence of a SCI, lower extremity or pelvic fracture, major head injury, or an indwelling femoral venous line) and who have received suboptimal prophylaxis or no prophylaxis
  
  We recommend DUS screening (Grade 1C).

Cancer patients

- We recommend that cancer patients undergoing surgical procedures receive prophylaxis that is appropriate for their current risk state (Grade 1A)

  Refer to the recommendations in the relevant surgical subsections.

- We recommend that hospitalized cancer patients who are bedridden with an acute medical illness receive prophylaxis that is appropriate for their current risk state (Grade 1A).

  Refer to the recommendations in the section dealing with medical patients.

- We suggest that clinicians not routinely use prophylaxis to try to prevent thrombosis related to long-term indwelling CVCs in cancer patients (Grade 2B). Specifically, we suggest that clinicians not use LMWH (Grade 2B), and we recommend against the use of fixed-dose warfarin (Grade 1B) for this indication.
Guidelines for prevention of thromboembolism

**Neurosurgery**

- We recommend that thromboprophylaxis be routinely used in patients undergoing major neurosurgery (*Grade 1A*).
- We recommend the use of IPC with or without GCS in patients undergoing intracranial neurosurgery (*Grade 1A*).
- Acceptable alternatives to the above options are prophylaxis with LDUH (*Grade 2B*) or postoperative LMWH (Enoxaparin 40 mg) (*Grade 2A*).
- We suggest the combination of mechanical prophylaxis (ie, GCS and/or IPC) and pharmacologic prophylaxis (ie, LDUH or LMWH) in high-risk neurosurgery patients (*Grade 2B*).

**Critical care**

- On admission to a critical care unit
  
  We recommend that all patients be assessed for their risk of VTE. Accordingly, most patients should receive thromboprophylaxis (*Grade 1A*).

- For patients who are at high risk for bleeding
  
  We recommend mechanical prophylaxis with GCS and/or IPC until the bleeding risk decreases (*Grade 1C+*).

- For ICU patients who are at moderate risk for VTE (eg, medically ill or postoperative patients)
  
  We recommend using LDUH or LMWH (eg, Enoxaparin 40 mg, od) prophylaxis (*Grade 1A*).

- For patients who are at higher risk such as that following major trauma or orthopedic surgery
  
  We recommend LMWH prophylaxis (*Grade 1A*).
Guidelines for prevention of thromboembolism

**Elective spine surgery**

- For spinal surgery patients with no additional risk factors
  We recommend against the routine use of any thromboprophylaxis modality, apart from early and persistent mobilization (Grade 1C).
- In patients undergoing spinal surgery, who exhibit additional risk factors, such as advanced age, known malignancy, presence of a neurologic deficit, previous VTE, or an anterior surgical approach
  We recommend that some form of prophylaxis be used (Grade 1B).
- For patients with additional risk factors
  We recommend any of the following prophylaxis options:
  - postoperative LDUH alone (Grade 1C+)
  - postoperative LMWH alone (Grade 1B)
  - perioperative IPC alone (Grade 1B)
  - Other considerations include perioperative GCS alone (Grade 2B)
  - perioperative IPC combined with GCS (Grade 2C).
  In patients with multiple risk factors for VTE, we recommend combining LDUH or LMWH with GCS and/or IPC (Grade 1C+).

**Long distance travel**

- We recommend the following general measures for long-distance travelers (ie, flights of >6 h duration):
  Avoidance of constrictive clothing around the lower extremities or waist; avoidance of dehydration and frequent calf muscle stretching (Grade 1C).
- For long-distance travelers with additional risk factors for VTE
  We recommend the general strategies listed above. If active prophylaxis is considered, because of the perceived increased risk of venous thrombosis, we suggest the use of:
  - Properly fitted, below-knee GCS, providing 15 to 30 mm Hg of pressure at the ankle (Grade 2B).
  - A single prophylactic dose of LMWH, injected prior to departure (Grade 2B).
- We recommend against the use of aspirin for VTE prevention associated with travel (Grade 1B).
Guidelines for prevention of thromboembolism

**Duration of prophylaxis**

- We recommend that patients undergoing THR, TKA, or HFS
  Receive thromboprophylaxis with LMWH (e.g. using a high-risk dose Enoxaparin 40 mg once daily), fondaparinux (2.5 mg daily), or a VKA (target INR, 2.5; INR range, 2.0 to 3.0) for at least 10 days (Grade 1A).

- We recommend that patients undergoing THR or HFS
  Be given extended prophylaxis for up to 28 to 35 days after surgery (Grade 1A).

  The recommended options for THR include:
  - LMWH (Grade 1A)
  - VKA (Grade 1A)
  - Fondaparinux (Grade 1C+).

  The recommended options following HFS are
  - Fondaparinux (Grade 1A)
  - LMWH (Grade 1C+)
  - VKA (Grade 1C+)

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**Stroke**

**Antithrombotic therapy for prevention of DVT and PE in AIS**

- For acute stroke patients with restricted mobility
  We recommend prophylactic LDUH or LMWH or heparinoids (Grade 1A).

- For patients who have contraindications to anticoagulants
  We recommend use of intermittent pneumatic compression devices or elastic stockings (Grade 1C)

**DVT/PE Prophylaxis in Patients with Intracerebral Hematoma (ICH)**

- In patients with an acute ICH
  We recommend the initial use intermittent pneumatic compression (Grade 1C+). In stable patients, we suggest LDUH may be initiated as soon as the second day after the onset of the hemorrhage (Grade 2C).
Other prophylaxis issues in major orthopedic surgery

Timing of prophylaxis initiation

For major orthopedic surgical procedures, we recommend that a decision about the timing of the initiation of pharmacologic prophylaxis be based on the efficacy-to-bleeding tradeoffs for that particular agent (Grade 1A).

For LMWH, there are only small differences between starting preoperatively or postoperatively, and both options are acceptable (Grade 1A).

Pre-hospital discharge screening for DVT

We recommend against the routine use of DUS screening at the time of hospital discharge in asymptomatic patients following major orthopedic surgery (Grade 1A).

Underlying values and preferences: The recommendation for subcutaneous heparin assumes a relatively low degree of risk aversion.

Anticoagulation for cerebral venous sinus Thrombosis

- In patients with venous sinus thrombosis
  
  We recommend that clinicians use:
  - Unfractionated heparin (Grade 1B)
  - Low molecular weight heparin (Grade 1B)
  Over no anticoagulant therapy during the acute phase, even in the presence of hemorrhagic infarction. In these patients.

  We recommend oral anticoagulation for 3 to 6 months (target INR, 2.5; range, 2.0 to 3.0) [Grade 1C].
For patients undergoing HFS

We recommend the routine use of fondaparinux (Grade 1A), LMWH at the usual high-risk dose e.g. Enoxaparin 40 mg once daily (Grade 1C+), adjusted-dose VKA [target INR, 2.5; INR range, 2.0 to 3.0] (Grade 2B), or LDUH (Grade 1B).

- We recommend against the use of aspirin alone (Grade 1A).
- If surgery will likely be delayed

We recommend that prophylaxis with either LDUH or LMWH be initiated during the time between hospital admission and surgery (Grade 1C+).

- If anticoagulant prophylaxis is contraindicated because of a high risk of bleeding

We recommend mechanical prophylaxis (Grade 1C+).
Knee arthroscopy

- We suggest clinicians do not use routine thromboprophylaxis in these patients, other than early mobilization (Grade 2B).

- For patients undergoing arthroscopic knee surgery who are at higher than usual risk, based on preexisting VTE risk factors or following a prolonged or complicated procedure,

  We suggest thromboprophylaxis with LMWH (Grade 2B).

△ Adjusted-dose LMWH:
  Weight-adjusted, full-treatment doses of LMWH administered once or twice daily (e.g. Enoxaparin 1mg/kg q12h, dalteparin 100 U/kg q12h, Tinzaparin 175 U/kg od or dalteparin 200 U/kg od).

As the half-life of LMWH is shorter in pregnancy, twice daily dosing is preferable, at least in the initial treatment phase.

△ Postpartum anticoagulants:
  Warfarin for 4 to 6 weeks with a target INR of 2.0 to 3.0, with initial UFH or LMWH overlap until the INR is ≥ 2.0.

△ In addition, the term surveillance
  Refers to clinical vigilance and aggressive investigation of women with symptoms suspicious of DVT or PE.

N.B: Please refer to the VTE RAM "risk Assessment Model", in order to have a better tool to assess the level of risk for your patient, which is a function of exposing (associated with clinical settings) & predisposing (associated with patient) risk factors.
Guidelines for prevention of thromboembolism

Elective knee arthroplasty

- For patients undergoing elective TKA, we recommend routine thromboprophylaxis using LMWH (at the usual high-risk dose e.g. Enoxaparin 40 mg once daily), fondaparinux, or adjusted-dose VKA (target INR, 2.5; INR range, 2.0 to 3.0) [all Grade 1A].

Underlying values and preferences. We have not recommended the use of fondaparinux over LMWH and VKA, or the use of LMWH over VKA, because we place a relatively low value on the prevention of venographic thrombosis, and a relatively high value on minimizing bleeding complications.

- The optimal use of IPC is an alternative option to anticoagulant prophylaxis (Grade 1B).
- We recommend against the use of any of the following as sole methods of thromboprophylaxis: aspirin (Grade 1A); LDUH (Grade 1A); or VFP (Grade 1B).

Risk factors for venous thromboembolism in pregnancy

- Age over 35 years
- Immobility
- Obesity
- Operative delivery
- Pre-eclampsia
- Parity greater than 4
- Surgical procedure in pregnancy or puerperium, e.g. postpartum sterilization
- Previous DVT
- Thrombophilia
  - congenital: antithrombin deficiency
  - protein C deficiency
  - protein S deficiency
  - factor V Leiden
  - prothrombin gene variant
  - acquired: lupus anticoagulant
  - anticardiolipin antibodies
- Excessive blood loss
- Paraplegia
- Sickle cell disease
- Inflammatory disorders and infection, e.g. inflammatory bowel disease and urinary tract infection
- Dehydration
**Orthopaedic surgery**

**Elective hip arthroplasty**

- For patients undergoing elective THR
  
  We recommend the routine use of one of the following three anticoagulants:
  
  **(1)** LMWH (at a usual high-risk dose Enoxaparin 40 mg once daily, started 12 h before surgery or 12 to 24 h after surgery, or 4 to 6 h after surgery at half the usual high-risk dose and then increasing to the usual high-risk dose the following day).
  
  **(2)** fondaparinux (2.5 mg started 6 to 8 h after surgery).
  
  or **(3)** adjusted-dose VKA started preoperatively or the evening after surgery (INR target, 2.5; INR range, 2.0 to 3.0)

[All Grade 1A]

**Underlying values and preferences.** We have not recommended the use of fondaparinux over LMWH and VKA, or the use of LMWH over VKA, because we place a relatively low value on the prevention of venographic thrombosis, and a relatively high value on minimizing bleeding complications.

- We recommend against the use of aspirin, dextran, LDUH, GCS, IPC, or VFP as the only method of thromboprophylaxis in these patients (Grade 1A).

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**New onset or transient**

- Surgical procedure in pregnancy or puerperium, e.g. evacuation of retained products of conception, postpartum sterilization.
- Ovarian hyperstimulation syndrome
- Severe infection, e.g. pyelonephritis
- Midcavity instrumental delivery
- Immobility (> 4 days bed rest)
- Immobility after delivery
- Excessive blood loss
- Prolonged labour
- Long-haul travel
- Pre-eclampsia
- Hyperemesis
- Dehydration
General recommendation

- All women should undergo an assessment of risk factors for VTE in early pregnancy or before pregnancy. This assessment should be repeated if the women is admitted to hospital or develop other intercurrent problems.

- Women with previous VTE should be screened for inherited and acquired Thrombophilia, ideally before pregnancy.

- Regardless of their risk of VTE, immobilization of women during pregnancy, labour and the puerperium should be minimized and dehydration should be avoided.

Laparoscopic surgery

- We recommend against routine thromboprophylaxis in these patients, other than aggressive mobilization (Grade 1A).

- For patients undergoing laparoscopic procedures, and who have additional thromboembolic risk factors

  We recommend the use of thromboprophylaxis with one or more of the following: LDUH, LMWH, IPC, or GCS (Grade 1C+).
Urologic surgery

• In patients undergoing transurethral or other Low-risk urologic procedures
  We recommend against the use of specific prophylaxis other than early and persistent mobilization (Grade 1C+).

• For patients undergoing major, open urologic Procedures
  We recommend routine prophylaxis with LDUH twice daily or three times daily (Grade 1A).
  Acceptable alternatives include prophylaxis with IPC and/or GCS (Grade 1B) or LMWH (Grade 1C).

• For urologic surgery patients who are actively bleeding, or are at very high risk for bleeding
  we recommend the use of mechanical prophylaxis with GCS and/or IPC at least until the bleeding risk decreases (Grade 1C+).

• For patients with multiple risk factors
  We recommend combining GCS and/or IPC with LDUH or LMWH (Grade 1C+).

No prior VTE or thrombophilia

• Women with three or more persisting risk factors
  Should be considered for thromboprophylaxis with LMWH antenatally and for three to five days postpartum.

• Women should be assessed before or during labour for risk factors for VTE
  Age over 35 years and BMI greater than 30 kg/cm², body weight greater than 90 kg are important independent risk factor for postpartum VTE even after vaginal delivery. The combination of either of these risk factors with any other risk factor for VTE (such as pre-eclampsia or immobility) or the presence of two other persisting risk factors
  Should lead the clinicians to consider the use of LMWH for three to five days.
Guidelines for prevention of thromboembolism

We recommend routine prophylaxis with LDUH, 5,000 U tid (Grade 1A), or higher doses of LMWH (e.g. Enoxaparin 40 mg) [Grade 1A]. Alternative considerations include IPC alone continued until hospital discharge (Grade 1A), or a combination of LDUH or LMWH plus mechanical prophylaxis with GCS or IPC (all Grade 1C).

- For patients undergoing major gynecologic procedures
  We suggest that prophylaxis continue until discharge from the hospital (Grade 1C).

- For patients who are at particularly high risk, including those who have undergone cancer surgery and are > 60 years of age or have previously experienced VTE
  We suggest continuing prophylaxis for 2 to 4 weeks after hospital discharge (Grade 2C).

N.B: Please refer to the VTE RAM "risk Assessment Model", in order to have a better tool to assess the level of risk for your patient, which is a function of exposing (associated with clinical settings) & predisposing (associated with patient) risk factors.

Please refer to medical patients section for medical setting.
Guidelines for prevention of thromboembolism

Gynecologic surgery

• For gynecologic surgery patients undergoing brief procedures of ≤30 min for benign disease

We recommend against the use of specific prophylaxis other than early and persistent mobilization (Grade 1C+).

• For patients undergoing laparoscopic gynecologic procedures, in whom additional VTE risk factors are present

We recommend the use of thromboprophylaxis with one or more of the following: LDUH, LMWH, IPC, or GCS (all Grade 1C).

• For patients undergoing major gynecologic surgery for benign disease, without additional risk factors,

We recommend LDUH, 5,000 U bid (Grade 1A). Alternatives include once-daily prophylaxis with LMWH e.g. Enoxaparin 40 mg (Grade 1C+), or IPC started just before surgery and used continuously while the patient is not ambulating. (Grade 1B).

• For patients undergoing extensive surgery for malignancy, and for patients with additional VTE risk factors

In patients with a single episode of VTE and Thrombophilia (confirmed laboratory abnormality) or a strong family history of thrombosis and not receiving long – term anticoagulants

One of the following regimens is recommended:
- prophylactic or intermediate dose LMWH
- Minidose or moderate-dose UFH, plus postpartum anticoagulant

• In antithrombin-deficient women, compound heterozygotes for prothrombin G20210A and factor V Leiden and homozygotes for these condition with a history of VTE

We recommend:
- Intermediate – dose LMWH prophylaxis
- Or moderate – dose UFH
In patients undergoing vascular surgery who do not have additional thromboembolic risk factors

We suggest that clinicians not routinely use thromboprophylaxis (Grade 2B).

For patients undergoing major vascular surgical procedures who have additional thromboembolic risk factors,

We recommend prophylaxis with LDUH or LMWH (e.g. Enoxaparin 40 mg) (Grade 1C+).

Enoxaparin to be started 1-2 hrs pre-operative

N.B:
Please refer to the VTE RAM "risk Assessment Model", in order to have a better tool to assess the level of risk for your patient, which is a function of exposing (associated with clinical settings) & predisposing (associated with patient) risk factors.

In patients with multiple (two or more) episodes of VTE and/or women receiving long-term anticoagulants

The recommended prophylaxis regimen is:
- Adjusted-dose UFH
- or adjusted-dose LMWH
Followed by resumption of long-term anticoagulants after delivery

In all women with previous DVT

Antenatally and postpartum, the added use of graduated elastic compression stocking is recommended.
• **High-risk general surgery patients with multiple Risk factors**

We recommend that pharmacologic methods (LMWH i.e., Enoxaparin 40 mg once daily or LDUH, tid) be Combined with the use of GCS and/or IPC (Grade 1C+).

• **In general surgery patients with a high risk of Bleeding**

We recommend the use of mechanical prophylaxis with properly fitted GCS or IPC, at least initially until the bleeding risk decreases (Grade 1A).

• **In selected high-risk general surgery patients**

Including those who have undergone major cancer surgery.

We suggest post-hospital discharge prophylaxis with LMWH (Enoxaparin 40 mg once daily) (Grade 2A).

**N.B:**

Please refer to the VTE RAM "risk Assessment Model", in order to have a better tool to assess the level of risk for your patient, which is a function of exposing (associated with clinical settings) & predisposing (associated with patient) risk factors.

---

**Inherited thrombophilia with no previous venous thromboembolism**

• In antithrombin-deficient women, compound heterozygotes for prothrombin G20210A and factor V Leiden, and homozygotes for these condition with no prior VTE

Active prophylaxis is recommended.

• In all other patients with no prior VTE and Thrombophilia (confirmed laboratory abnormality)

Surveillance or prophylactic LMWH or minidose unfractionated heparin (UH), plus postpartum anticoagulant is recommended.
Guidelines for prevention of thromboembolism

Neuroaxial anesthesia/analgesia in patients receiving VTE prophylaxis

Patients receiving subcutaneous LDUH or LMWH

- Needle insertion should be delayed at least 8 - 12 hours after the subcutaneous dose of LDUH or the twice-daily prophylactic dose of LMWH, or at least 18 hours after a once daily LMWH injection.

- Anticoagulant prophylaxis should be delayed if a hemorrhagic aspirate (i.e. bloody tap) is encountered during the initial spinal needle insertion.

- Removal of an epidural catheter should be done when the anticoagulant effect is at minimum (usually just before the next schedules dose).

- Anticoagulant prophylaxis should be delayed at least 2 hours after spinal needle or epidural catheter removal.

- Indwelling catheters can successfully be maintained while on LDUH or LMWH prophylaxis.

General surgery

- In low-risk general surgery patients
  Who are undergoing a minor procedure, are <40 years of age, and have no additional risk factors.
  we recommend against the use of specific prophylaxis other than early and persistent mobilization (Grade 1C+).

- Moderate-risk general surgery patients
  Are those patients undergoing a non major procedure and are between the ages of 40 and 60 years, Or have additional risk factors.
  Patients who are undergoing major operations and are <40 years of age with no additional risk factors.
  We recommend prophylaxis with LMWH, e.g. Enoxaparin 20 mg once daily LDUH, 5,000 U bid (both Grade 1A).

- Higher-risk general surgery patients
  Are those undergoing non major surgery and are > 60 years of age or have additional risk factors.
  Patients undergoing major surgery who are >40 years of age or have additional risk factors.
  We recommend thromboprophylaxis with LMWH, e.g. Enoxaparin 40 mg once daily or LDUH, 5,000 U tid (both Grade 1A).
VTE risk factors

Table 3 – Risk Factors for VTE

<table>
<thead>
<tr>
<th>Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trauma (major or lower extremity)</td>
</tr>
<tr>
<td>Immobility, paresis</td>
</tr>
<tr>
<td>Malignancy</td>
</tr>
<tr>
<td>Cancer therapy (hormonal, chemotherapy, or radiotherapy)</td>
</tr>
<tr>
<td>Previous VTE</td>
</tr>
<tr>
<td>Increasing age</td>
</tr>
<tr>
<td>Pregnancy and the postpartum period</td>
</tr>
<tr>
<td>Estrogen-containing oral contraception or (HRT)</td>
</tr>
<tr>
<td>Selective estrogen receptor modulators</td>
</tr>
<tr>
<td>Acute medical illness</td>
</tr>
<tr>
<td>Heart or respiratory failure</td>
</tr>
<tr>
<td>Inflammatory bowel disease</td>
</tr>
<tr>
<td>Nephritic syndrome</td>
</tr>
<tr>
<td>Myeloproliferative disorders</td>
</tr>
<tr>
<td>Paroxysmal nocturnal hemoglobinuria</td>
</tr>
<tr>
<td>Obesity</td>
</tr>
<tr>
<td>Smoking</td>
</tr>
<tr>
<td>Varicose veins</td>
</tr>
<tr>
<td>Central venous catheterization</td>
</tr>
<tr>
<td>Inherited or acquired thrombophilia</td>
</tr>
</tbody>
</table>

N.B: Please refer to Page 55 for “VTE Risk Assessment Model” RAM for medical & surgical patients, in order to have a guide in stratifying your patients at risk of developing DVT or PE (ie, very high, high, moderate, or low risk).

Patients on VKA (oral anticoagulant)

- In patients on chronic Warfarin therapy, anticoagulant should be stopped (ideally 4-5 days) prior to the neuroaxial anaesthesia and INR should be measured.

- In patients receiving an initial dose of Warfarin prior to surgery, INR should be checked prior to the procedure if the first dose was given more than 24 hours earlier.

- In patients receiving low-dose Warfarin (≤ 5mg daily) therapy during epidural analgesia, INR should be checked on a daily basis and checked before catheter removal.

- Before removal of the epidural catheter, INR must be documented to be < 1.5.

- Neurologic testing of sensory and motor function should be performed routinely for patients on Warfarin therapy and at least for 24 hours after catheter removal if the INR was > 1.5 at the time of removal.
- Warfarin should be stopped if INR > 3 in a patient with an indwelling epidural catheter.

- It is recommended that epidural analgesia should not be used for longer than 1 or 2 days because of the unpredictable anticoagulant effect of the anticoagulant.

### Grading recommendation

**Grade 1**

If the guideline developers are very certain that benefits do, or do not, outweigh risks, burdens, and costs, they will make a strong recommendation.

**Grade 2**

If they are less certain of the magnitude of the benefits and the risks, burdens, and costs, and thus of their relative impact, they make a weaker recommendation.

**Grade A**

Consistent results from RCTs

**Grade C+**

Observational studies with very strong effects or secure generalizations from randomized clinical trials (RCTs).

**Grade B**

Inconsistent results from RCTs

**Grade C**

Observational studies

We now use the language “**we recommend**” for strong recommendations (ie, Grades 1A, 1C+, 1B, and 1C) and “**we suggest**” for weaker recommendations (ie, Grades 2A, 2C+, 2B, and 2C).
• We recommend consideration of renal impairment when deciding on doses of LMWH, fondaparinux, the direct thrombin inhibitors, and other antithrombotic drugs that are cleared by the kidneys, particularly in elderly patients and those who are at high risk for bleeding. (Grade 1C+).

(Refer to page 51 for dose adjustment)

• In all patients undergoing neuraxial anesthesia or analgesia, we recommend special caution when using anticoagulant prophylaxis (Grade 1C).
• For patients at both extreme body weight, dose should be adjusted according to the manufacturer’s guidelines.
• With the exception of VTE prophylaxis during pregnancy, there is no need for laboratory monitoring for patients receiving VTE prophylaxis.

Patient on fondaparinux

Current ACCP guideline recommended that Fondaparinux should not be administered along with continuous epidural anesthesia because of lack of data on its safety.

Because of the unpredictable anticoagulant effect of the anticoagulant.

All patients should be monitored carefully and frequently for the symptoms and signs of cord compression.

These symptoms include progression of lower extremity numbness or weakness, bowel or bladder dysfunction, and new onset of back pain. If spinal hematoma is suspected, diagnostic imaging and definitive surgical therapy must be performed rapidly to reduce the risk of permanent paresis.
Guidelines for prevention of thromboembolism

General recommendations

- All hospitalized patients should be assessed for their risk of venous thromboembolic disease and considered for prophylaxis.
- Early ambulation should be considered for all patients as soon as the clinical condition permits.
- We recommend that mechanical methods of prophylaxis be used primarily in patients who are at high risk of bleeding (Grade 1C+) or as an adjunct to anticoagulant-based prophylaxis (Grade 2A). We recommend that careful attention be directed toward ensuring the proper use of, and optimal compliance with, the mechanical device (Grade 1C+).
- We recommend against the use of aspirin alone as prophylaxis against VTE for any patient group (Grade 1A).
- For each of the antithrombotic agents, we recommend that clinicians consider the manufacturer’s suggested dosing guidelines (Grade 1C).
### Rational for thromboprophylaxis

**Table 2 – Rational for Thrombophylaxis in Hospitalized Patients**

<table>
<thead>
<tr>
<th>Rational</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>High prevalence of VTE</td>
<td>Most hospitalized patients have risk factors for VTE. DVT is common in many hospitalized patient groups. It may be difficult to predict which at-risk patients will develop symptomatic thromboembolic complications. Complications are common and may be silent. Difficulty in predicting which at-risk patients will develop symptomatic DVT and PE. Cost of investigating asymptomatic patients is neither effective nor cost-effective.</td>
</tr>
<tr>
<td>Adverse consequence of unprevented VTE</td>
<td>Symptomatic DVT and PE. Costs and risks of treating unprevented VTE, especially bleeding. Chronic post thrombotic syndrome.</td>
</tr>
<tr>
<td>Efficacy and effectiveness of thromboprophylaxis</td>
<td>Thromboprophylaxis is highly efficacious at preventing DVT and proximal DVT and significantly reduces the risk of subsequent thromboembolic events. Cost-effectiveness of prophylaxis has repeatedly been demonstrated.</td>
</tr>
</tbody>
</table>

---


3.2 The recommendations of the 7th ACCP conference on Antithrombotic and thrombolytic therapy.

Introduction

Dear Colleagues,

It’s our pleasure to introduce these state-of-the-art guidelines for venous thrombo-embolism (VTE) prophylaxis, which is based on the most recently issued ACCP, IUA, ASRA & RCOG guidelines.

Recent evidence indicates that VTE is a major health problem. The Agency for Healthcare Research and Quality ranked 79 patient safety interventions based on the strength of the evidence supporting more widespread implementation of these procedures. The highest ranked safety practice was the appropriate use of prophylaxis to prevent VTE in patients at risk. Despite all this evidence, the risk remains underestimated and its management is suboptimal.

With the help of VTE committee in our institute, we will try to cover the wide variety of topics including VTE prophylaxis for different types of patients (critically ill patients, general medical, surgical, Obstetric, etc….) in this booklet. Trying to cover important issues related to our daily practice and answer outstanding questions in VTE.

This protocol with other tool provided for all health care professionals in our institute, will help us to raise VTE awareness as well as increase prophylaxis rate, for the sake of our patients.

Finally we are very confident that by your help, cooperation & compliance to the guidelines, we will find this project “DVT Safety Zone” a very helpful, informative tool. We are sure that, this program will be reflected on a better care for our patients.

Best regards

VTE Committee members

---

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dosage regimen</th>
</tr>
</thead>
<tbody>
<tr>
<td>DVT prophylaxis in: Abdominal surgery</td>
<td>30 mg SC once a day</td>
</tr>
<tr>
<td>Hip or knee-replacement surgery</td>
<td></td>
</tr>
<tr>
<td>Medical patients during acute illness</td>
<td></td>
</tr>
<tr>
<td>Prophylaxis of ischemic complications of UA/NSTEMI*</td>
<td>1 mg/kg SC once a day (when concurrently administered with aspirin)</td>
</tr>
<tr>
<td>Inpatients with acute DVT with or without PE</td>
<td>1 mg/kg SC once a day (in conjunction with warfarin in sodium therapy)</td>
</tr>
<tr>
<td>Outpatients with acute DVT without PE</td>
<td>1 mg/kg SC once a day (in conjunction with warfarin in sodium therapy)</td>
</tr>
</tbody>
</table>

*Cockcroft-Gault equation for estimating creatinine clearance:

For men:

\[ \text{Creatinine clearance} = \frac{(140 - \text{age}) \times \text{weight (kg)}}{72 \times \text{serum creatinine (mg/100 mL)}} \]

For women:

\[ \text{Creatinine clearance} = \frac{(140 - \text{age}) \times \text{weight (kg)}}{72 \times \text{serum creatinine (mg/100 mL)}} \times 0.85 \]


*UA/NSTEMI=Unstable Angina and non-0-wave myocardial infarction.
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Critical care 31
Long distance travel 32
Stroke 33
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  • DVT/PE prophylaxis in patients with intracerebral hematoma (ICH) 33
  • Anticoagulation for cerebral venous sinus thrombosis 34
VTE prophylaxis during pregnancy and postpartum 35
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Guidelines for prevention of thromboembolism

Enoxaparin dosing in special populations

For moderate and mild renal impairment*
  ▶ Moderate renal impairment: creatinine clearance 30-50 mL/min
  ▶ Mild renal impairment: creatinine clearance 50-80 mL/min

* No dose adjustment is recommended for these populations; however, all such patients should be observed carefully for signs and symptoms of bleeding.

For low-weight or obese patients†
  ▶ Low-weight women (<45 kg)
  ▶ Low-weight men (<57 kg)
  ▶ Obese men and women

† There are no recommendations for dose adjustments for these populations; however, low-weight patients should be observed carefully for signs and symptoms of bleeding.

Clinical pharmacology information
  ▶ Anti-Xa exposure after a non-weight-adjusted (prophylaxis) dose is 52% higher in low-weight women (<45 kg) and 27% higher in low-weight men (<57 kg)
  ▶ In obese men and women (BMI 30-48 kg/m²), anti-Xa exposure after weight-adjusted doses is marginally higher at steady state, while Amax is not increased.
Guidelines for prevention of thromboembolism

Appendix

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Abbreviations

AIS  Acute Ischemic Stroke
DUS  Doppler Ultrasound
DVT  Deep Venous Thrombosis
GCS  Gradual Compression Stocking
HFS  Hip Fracture Surgery
ICH  Intra Cerebral Hematoma
IPC  Intermittent Pneumatic Compression
LDUH  Low Dose Unfractionated Heparin
LMWH  Low Molecular Weight Heparin
PE  Pulmonary Embolism
RCT  Randomized Clinical Trials
SCI  Spinal Cord Injury
TKA  Total Knee Arthroplasty
THA  Total Hip Arthroplasty
THR  Total Hip Replacement
VKA  Vitamin K Antagonist
VTE  Venous Thrombo-Embolism
VFP  Venous Foot Pump
Guidelines for prevention of thromboembolism in adults at rest or at risk?

Instructions for use

Enoxaparin administration

1. Pick an area on the right or left side of the abdomen in a laying or sitting position, at least 2 inches from the navel and out toward the waist. Clean the injection site with sterile alcohol swab and let dry. Alternate injection sites between left and right sides.

2. Carefully remove the needle cap by firmly pulling it straight off the syringe and discard. If required, dose adjustment must be done prior to injection. Do not expel the air bubble from the syringe before the injection.

3. Gently pinch the cleansed area of the abdomen between your thumb and index finger to make a fold in the skin. Insert the full length of the needle at a 90˚ angle into the fold of the skin. Inject using standard technique, pushing the plunger to the bottom of the syringe.

4. Remove the needle from the injection site, keeping your finger on the plunger. To minimize bruising do not rub the injection site after completion of the injection.

5. Immediately dispose off the syringe in the nearest sharps collector.
Risk Assessment Model

Proposed VTE RAM for surgical and medical patients

Step 1: Exposing risk factors associated with clinical setting

<table>
<thead>
<tr>
<th>Assign 1 Factor</th>
<th>Assign 2 Factors</th>
<th>Assign 3 Factors</th>
<th>Assign 4 Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor Surgery*</td>
<td>Major Surgery*</td>
<td>Myositis infarct</td>
<td>Effective lower</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>extremity</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>subclavian artery</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Stroke</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Multiple trauma</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Acute spinal cord</td>
</tr>
</tbody>
</table>

CLINICAL SITTING

Minor Surgery* Major Surgery* Myocardial infarction Effective lower extremity

Step 2: Predisposing risk factors associated with patient

<table>
<thead>
<tr>
<th>Assign 1 Factor unless otherwise noted</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLINICAL SITTING</td>
</tr>
<tr>
<td>Age 40 to 60 years (1 factor)</td>
</tr>
<tr>
<td>History of DVT/PE (3 factors)</td>
</tr>
<tr>
<td>Obesity (&gt;20% ideal body weight)</td>
</tr>
<tr>
<td>Varicose veins</td>
</tr>
<tr>
<td>Antithrombin III deficiency (1 factor)</td>
</tr>
<tr>
<td>Protein C and S deficiency (2 factors)</td>
</tr>
<tr>
<td>Factor V Leiden/activated protein C</td>
</tr>
<tr>
<td>Lupus anticoagulant (3 factors)</td>
</tr>
<tr>
<td>Antiphospholipid antibodies (3 factors)</td>
</tr>
<tr>
<td>Proteins C and S deficiency (3 factors)</td>
</tr>
<tr>
<td>Multiple trauma (3 factors)</td>
</tr>
<tr>
<td>Antithrombin III deficiency (1 factor)</td>
</tr>
<tr>
<td>Lupus anticoagulant (3 factors)</td>
</tr>
<tr>
<td>Antiphospholipid antibodies (3 factors)</td>
</tr>
<tr>
<td>Leafy &gt;50% (2 factors)</td>
</tr>
<tr>
<td>Combined anticoagulant/terminal</td>
</tr>
<tr>
<td>replacement therapy</td>
</tr>
</tbody>
</table>

Total additional predisposing risk factors score: .........................................................

Step 3: Total risk factors (exposing + predisposing):

Step 4: Recommended prophylactic regimens for each risk group

<table>
<thead>
<tr>
<th>Low risk (1 Factor)</th>
<th>Moderate risk (2-4 factors)</th>
<th>High risk (5-8 factors)</th>
<th>Highest risk (9 or more factors)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No-specific measures</td>
<td>Low-dose unfractionated heparin (LDUFH) or LMWH</td>
<td>Graduated compression stockings (GCS)</td>
<td>Adjusted-dose heparin (ADH)</td>
</tr>
<tr>
<td>Early mobilisation</td>
<td>LMWH or unfractionated heparin (UFH) or LMWH</td>
<td>LMWH or UFH (2-800 U/kg)</td>
<td>LMWH or UFH (2-800 U/kg)</td>
</tr>
</tbody>
</table>

Abbreviations: LDUFH, low-dose unfractionated heparin; IPC, intermittent pneumatic compression; GCS, graduated compression stockings.

Capri et al: effective risk stratification of surgical & medical Patients for VTE. Seminar in hematology Vol 38. No2, suppl 5, April 2001
## Risk Assessment Model

### Proposed VTE RAM for surgical and medical patients

**Step 1:** Exposing risk factors associated with clinical setting

<table>
<thead>
<tr>
<th>Assign 1 Factor</th>
<th>Assign 2 Factors</th>
<th>Assign 3 Factors</th>
<th>Assign 4 Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor Surgery*</td>
<td>Major Surgery*</td>
<td>Myocardial Infarct</td>
<td>Effective lower extremity anticoagulation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Coagulation</td>
<td>Hip, pelvis or long bone fracture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stroke</td>
<td>Multiple trauma</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Central venous cannula removal</td>
<td>Acute spinal cord injury</td>
</tr>
</tbody>
</table>

**CLINICAL SITTING**

<table>
<thead>
<tr>
<th>Minor Surgery*</th>
<th>Major Surgery*</th>
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</tr>
</thead>
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<tr>
<td></td>
<td></td>
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<td>Hip, pelvis or long bone fracture</td>
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<td></td>
<td></td>
<td>Stroke</td>
<td>Multiple trauma</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Central venous cannula removal</td>
<td>Acute spinal cord injury</td>
</tr>
</tbody>
</table>

### Step 2: Predisposing risk factors associated with patient

<table>
<thead>
<tr>
<th>CLINICAL SITTING</th>
<th>MOLECULAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor Surgery*</td>
<td>Factor-V Leiden/activated protein C resistance (6 factors)</td>
</tr>
<tr>
<td>Major Surgery*</td>
<td>Antithrombin III deficiency (3 factors)</td>
</tr>
<tr>
<td></td>
<td>Proteins C and S deficiency (2 factors)</td>
</tr>
<tr>
<td></td>
<td>D-dimer (2 factors)</td>
</tr>
<tr>
<td></td>
<td>Lupus anticoagulant (3 factors)</td>
</tr>
</tbody>
</table>

**CLINICAL SITTING**

<table>
<thead>
<tr>
<th>Minor Surgery*</th>
<th>Major Surgery*</th>
<th>Factor-V Leiden/activated protein C resistance (6 factors)</th>
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<tr>
<td></td>
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<td>Antithrombin III deficiency (3 factors)</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>D-dimer (2 factors)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lupus anticoagulant (3 factors)</td>
</tr>
</tbody>
</table>

### Step 3: Total risk factors (exposing + predisposing):

<table>
<thead>
<tr>
<th>Low risk (1 Factor)</th>
<th>Moderate-risk (2-4 Factors)</th>
<th>High-risk (5-6 Factors)</th>
<th>Highest risk (7 or more Factors)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No specific measures</td>
<td>LDH/H and 12h LMWH/IPC and GCS</td>
<td>LDH/H and 12h LMWH and IPC</td>
<td>D-dimer &gt; 500 U/L or LMWH, SCF &gt; 4.5U/L or LMWH, Antiplatelet drugs</td>
</tr>
<tr>
<td>Elevation</td>
<td>GCS &lt; 12 or LMWH</td>
<td></td>
<td>Adjunctive care measures</td>
</tr>
</tbody>
</table>

**Abbreviations:** LDH/H, low dose unfractionated heparin; IPC, intermittent pneumatic compression; GCS, graduated compression stockings.

1. Operations in which the dissection is important or that last longer than 45 minutes, including open surgical procedures.
2. Baseline risk score (4 or less) in step 1.
3. Assignment unless otherwise noted.

### Step 4: Recommended prophylactic regimens for each risk group

- Early ambulation
- GCS† (+LDUFH or LMWH) Adjusted-dose heparin
- IPC‡ (+LDUFH or LMWH)

**Abbreviations:** LDUFH, low-dose unfractionated heparin; IPC, intermittent pneumatic compression; GCS, graduated compression stockings.

† Combining GCS with other prophylactic methods (LDUFH, LMWH, or IPC) may give better protection.

‡ Data show benefit of plantar pneumatic compression in orthopedic total arthroplasty and leg trauma and can be used with IPC if not feasible or tolerated.

* Operations in which the dissection is important or that last longer than 45 minutes, including open surgical procedures.

**Baseline risk factor score (if score = 5, go to step 4):**

55

**Proposed VTE RAM for surgical and medical patients**

- Capri et al: effective risk stratification of surgical & non-surgical Patients for VTE. Seminar in hematology Vol 38. NO2, suppl 5, April 2001