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Venous Thromboembolism (VTE) Prophylaxis for Adult Patients

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**NON-SURGICAL HOSPITALIZED PATIENTS**

**INITIAL EVALUATION**

Patient admitted to hospital

Assess for VTE risk factors\(^1\) and bleeding risk\(^2\) at time of admission and reassess as clinically indicated

**VTE RISK**

- **MODERATE RISK**
  - Patients with one or more VTE risk factors\(^1\)

  Does patient have contraindications to pharmacologic prophylaxis\(^3\)?:

  - Yes
    - SCD and/or TED hoses
      - Mechanical prophylaxis devices should be worn as often as possible during admission. TED hoses may be associated with skin complications.
  - No
    - Pharmacological prophylaxis\(^4,5\)** and
      - Optional SCD and/or TED hoses
        - Mechanical prophylaxis devices should be worn as often as possible during admission. TED hoses may be associated with skin complications.
      - If neuraxial catheter planned or in place, see Appendix F for Spinal Procedure and/or Epidural Placement Management

- **LOW RISK**
  - Fully ambulatory with no active cancer diagnosis and expected length of stay < 48 hours
  - Admission or observation for chemotherapy infusion and expected length of stay < 48 hours

SCD = sequential compression device

\(^1\) See Appendix A for VTE Risk Factors
\(^2\) See Appendix B for Factors with a Strong Association with Bleeding Risk in Hospitalized Medical Patients
\(^3\) See Appendix C for Contraindications to Pharmacologic Options for VTE Prophylaxis
\(^4\) See Appendix D for Pharmacological Options for VTE Prophylaxis
\(^5\) See Appendix E for Dosing Recommendations for Renal Impairment, Obesity, and Underweight Patients
INITIAL EVALUATION

Patient admitted to hospital

Assess for VTE risk factors and risk factors for major bleeding at time of admission and reassess as clinically indicated

SURGICAL HOSPITALIZED PATIENTS

VTE RISK

HIGH RISK
- Major surgery for cancer with one or more VTE risk factors other than active cancer
- Abdominal or pelvic surgery for cancer
- Major orthopedic surgery for cancer

Does patient have contraindications to pharmacologic prophylaxis?

Yes
- Pharmacological prophylaxis and SCD

No
- If neuraxial catheter planned or in place, see Appendix F for Spinal Procedure and/or Epidural Placement Management

MODERATE RISK
- Major surgery for cancer with no additional VTE risk factors

Does patient have contraindications to pharmacologic prophylaxis?

Yes
- Pharmacological prophylaxis and SCD

No
- Optional SCD

LOW RISK
- Minor general and orthopedic surgery with expected length of stay < 24 hours

MANAGEMENT

Yes
- Ambulation and Optional SCD

No

SCD = sequential compression device

1 See Appendix A for VTE Risk Factors

2 See Appendix G for Risk Factors for Major Bleeding Complications in Surgical Patients

3 Major surgeries are usually extensive and warrant an overnight or extended stay in a hospital. These surgeries include extensive work such as entering a body cavity, removing an organ or altering the body’s anatomy. Patients undergoing major surgeries usually require admission to the hospital, anesthesia and respiratory assistance.

4 See Appendix C for Contraindications to Pharmacologic Options for VTE Prophylaxis

5 Mechanical prophylaxis devices should be worn as often as possible during admission. TED hoses are available if needed for appropriate patients; they may be associated with skin complications.

6 See Appendix D for Pharmacological Options for VTE Prophylaxis

7 See Appendix E for Dosing Recommendations for Renal Impairment, Obesity, and Underweight Patients

8 Minor surgeries are generally superficial and do not require penetration of a body cavity. Patients are often discharged home the same day as the procedure. For example: visual inspections performed inside in rectum, vagina, uterus, or bladder would be considered minor. They do not involve assisted breathing or anesthesia and are usually performed by a single doctor.

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INITIAL EVALUATION

Assess for VTE risk factors\(^1\) and bleeding risk\(^2\) as clinically indicated

VTE RISK

- Multiple myeloma on immuno-modulatory drug (IMiD) regimens and no contraindications\(^3\)
- Starting a new chemotherapy regimen with a low risk of bleeding and no contraindications\(^3\)
- High risk outpatients with low risk of bleeding and no contraindications\(^3\)
- High risk cancer types: pancreas, stomach, bladder, gynecologic, lung, lymphoma, testicular

MANAGEMENT

IMPEDE score\(^4\)
- \(> 3\): High risk – recommend pharmacologic prophylaxis\(^5,6\) (enoxaparin or dalteparin)
- \(\leq 3\): Low risk – recommend no pharmacologic prophylaxis or aspirin

Khorana score\(^7\)
- \(\geq 2\): Consider and discuss with patient pharmacologic thromboprophylaxis\(^5,6\) for up to 6 months (apixaban, rivaroxaban, or LMWH)
- \(< 2\): No pharmacologic prophylaxis recommended

Does the patient have at least one additional VTE risk factor other than active cancer?

Yes → Consider and discuss with patient pharmacologic prophylaxis\(^5,6\) (apixaban, rivaroxaban, or LMWH)

No → No prophylaxis recommended

\(^1\) See Appendix A for VTE Risk Factors
\(^2\) Currently no recommended method to assess bleeding risk for ambulatory cancer patients. However, the following factors that may put the patient at a higher risk of bleeding should be considered: anemia, age \(\geq 75\) years old, prior hemorrhage, bleeding disorder, hypertension, severe renal disease, and concurrent antiplatelet therapy.
\(^3\) See Appendix C for Contraindications to Pharmacologic Options for VTE Prophylaxis
\(^4\) See Appendix H for IMPEDE VTE Score
\(^5\) See Appendix D for Pharmacological Options for VTE Prophylaxis
\(^6\) See Appendix E for Dosing Recommendations for Renal Impairment, Obesity, and Underweight
\(^7\) Khorana Risk Score calculator: https://www.mdcalc.com/khorana-risk-score-venous-thromboembolism-cancer-patients

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Venous Thromboembolism (VTE) Prophylaxis for Adult Patients

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APPENDIX A: VTE Risk Factors

- Active cancer (or suspicion of cancer)
- Age 60 years or older
- Prior VTE
- Advanced stage of cancer
- Medical comorbidities (infection, renal disease, pulmonary disease, congestive heart failure, arterial thromboembolism)
- Familial and/or acquired hypercoagulability
- Major surgery
- Central venous catheter/IV catheter
- Chemotherapy (immunomodulating agents\(^1\) [IMiD] that have antiangiogenic properties)
- Exogenous estrogen compounds (hormone replacement, contraceptives, tamoxifen/raloxifene, diethylstilbestrol)
- Erythropoietin stimulating agents
- Poor performance status
- Nephrotic syndrome
- Major trauma
- Spinal cord injury
- Smoking
- Obesity (BMI > 30 kg/m\(^2\))
- Pregnancy
- Immobility for at least 3 days

APPENDIX B: Factors With a Strong Association With Bleeding Risk in Hospitalized Medical Patients

- Active gastroduodenal ulcer
- Bleeding in the previous 3 months prior to admission
- Platelet count < 50 K/microliter
- Age > 85 years
- Hepatic failure
- Severe renal failure
- ICU admission
- Coagulopathy

\(^1\) Thalidomide/lenalidomide with high-dose dexamethasone
Venous Thromboembolism (VTE) Prophylaxis for Adult Patients

APPENDIX C: Contraindications to Pharmacological Options for VTE Prophylaxis

- Active bleeding
- Patient currently on treatment dose anticoagulation
- Thrombocytopenia (platelets < 20 K/microliter or clinical judgement)
- Anticipated thrombocytopenia
- Recent high-risk surgery or bleeding event
- Recent CNS bleed¹
- Recent neurosurgery¹
- Intracranial or spinal lesion at high risk of bleeding
- Underlying coagulopathy
- Patient on protocol that prohibits anticoagulation
- Severe uncontrolled malignant hypertension
- Risk outweighs benefit in patients when death is imminent

¹ Consult/refer to Neurosurgery if any evidence of acute bleed on CT scans. For any other concerns about starting VTE prophylaxis, consult/refer to Benign Hematology.

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## APPENDIX D: Pharmacological Options for VTE Prophylaxis

<table>
<thead>
<tr>
<th>Patient Group</th>
<th>Medication Regimen¹</th>
<th>Peri-operative Considerations</th>
<th>Extended Prophylaxis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Surgical Patients</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High risk - Major surgery for cancer with one or more VTE risk factors² other than active cancer</td>
<td>- Enoxaparin 40 mg SQ every 24 hours or Heparin 5000 units SQ every 8 hours&lt;br&gt;- Add SCDs during hospital stay</td>
<td>- First dose of VTE prophylaxis agent may be given preoperatively, intraoperatively, or postoperatively. If given postoperatively, it is recommended to be given with 24 hours of surgery.&lt;br&gt;- For management of patients currently on prophylaxis, see institutional algorithm³</td>
<td>Prophylaxis should be continued for at least 7-10 days. Extended VTE prophylaxis can be considered for high risk patients on a case by case basis⁴.</td>
</tr>
<tr>
<td>Patients with open or laparoscopic abdominal or pelvic surgery</td>
<td>- Enoxaparin 40 mg SQ every 24 hours or Heparin 5000 units SQ every 8 hours&lt;br&gt;- Add SCDs during hospital stay</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate risk - Major surgery for cancer with no additional VTE risk factors²</td>
<td>- Enoxaparin 40 mg SQ every 24 hours or Heparin 5000 units SQ every 8 hours&lt;br&gt;- SCDs are optional</td>
<td></td>
<td>None</td>
</tr>
<tr>
<td><strong>Orthopedic Surgery</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High risk orthopedic surgeries</td>
<td>- Enoxaparin 30 mg SQ every 12 hours or Heparin 5000 units SQ every 8 hours&lt;br&gt;- Add SCDs during hospital stay</td>
<td>- Start 12 hours or more preoperatively or 12 hours or more postoperatively⁵&lt;br&gt;- For management of patients currently on prophylaxis, see institutional algorithm³</td>
<td>Minimum 10-14 days; extended to 30 days recommended⁶&lt;br&gt;- Alternative option at discharge: Aspirin 81-325 mg PO every 12-24 hours</td>
</tr>
<tr>
<td><strong>Neurosurgery or Spinal Surgery</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate risk - No additional VTE risk factors²</td>
<td>- SCDs alone for at least 24-48 hours&lt;br&gt;- Once adequate hemostasis is established and the risk of bleeding decreases then transition to enoxaparin 40 mg SQ every 24 hours or heparin 5000 units SQ every 8 hours</td>
<td>For management of patients currently on prophylaxis, see institutional algorithm³</td>
<td>None</td>
</tr>
<tr>
<td>High risk - One or more VTE risk factors² other than active cancer</td>
<td></td>
<td></td>
<td>See Ambulatory Cancer Patients on Page 4</td>
</tr>
</tbody>
</table>

¹This section includes first line options. Additional pharmacologic prophylaxis options and dosing for renal dysfunction can be seen in Appendix E.
²See Appendix A for VTE Risk Factors
³For more information on peri-procedure management of anticoagulants, see Peri-Procedure Management of Anticoagulants algorithm
⁴Enoxaparin or apixaban may be utilized for extended duration prophylaxis at hospital discharge
⁵Alternative option at discharge: Aspirin 81-325 mg PO every 12-24 hours
⁶Alternative option at discharge: Aspirin 81-325 mg PO every 12-24 hours
### APPENDIX D: Pharmacological Options for VTE Prophylaxis - continued

<table>
<thead>
<tr>
<th>Patient group</th>
<th>Medication Regimen¹</th>
<th>Peri-operative Considerations</th>
<th>Extended Prophylaxis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Non-Surgical Hospitalized Patients</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Moderate risk                                      | • Enoxaparin 40 mg SQ every 24 hours or ¹  
• Heparin 5000 units SQ every 8 hours               | See institutional algorithm²  | See Ambulatory Cancer Patients on Page 4 |
| Patients intolerant to heparin products or         | • Fondaparinux 2.5 mg SQ every 24 hours³ or ¹  
• Dalteparin 10 mg every 24 hours⁴ or ¹  
• Apixaban 2.5 mg PO every 12 hours⁴              | See institutional algorithm²  | See Ambulatory Cancer Patients on Page 4 |
| those who prefer to avoid pork products            |                     |                                |                      |

| **Ambulatory Cancer Patients**                      |                     |                                |                      |
| Multiple Myeloma patients receiving IMiD (i.e., thalidomide or lenalidomide) | High Risk:  
• Enoxaparin 40 mg SQ every 24 hours or ¹  
• Dalteparin 5,000 units SQ every 24 hours  
Low Risk:  
• No prophylaxis or ¹  
• Aspirin 81-325 mg PO every 24 hours | See institutional algorithm²  | Continue while on immunomodulatory drugs |

| • Khorana score ≥ 2 prior to starting a new        | • Enoxaparin 40 mg SQ every 24 hours or ¹  
• High risk outpatients                              | See institutional algorithm²  | Continue for 6 months then reassess |
| chemotherapy regimen or or                        | • Rivaroxaban 10 mg PO every 24 hours³ or ¹  
• Apixaban 2.5 mg PO every 12 hours⁴               |                                |                      |

IMiD = immunomodulatory drug

¹ This section includes first line options. Additional pharmacologic prophylaxis and dosing for renal dysfunction can be seen in Appendix E

² For more information on peri-procedure management of anticoagulants see Peri-Procedure Management of Anticoagulants algorithm

³ Contraindicated if total body weight < 50 kg

⁴ Check for drug interactions prior to use

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### APPENDIX E: Dosing Recommendations for Renal Impairment, Obesity, and Underweight Patients

<table>
<thead>
<tr>
<th>Patient Population</th>
<th>Creatinine Clearance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CrCl &gt; 30 ml/min</td>
</tr>
<tr>
<td>BMI &lt; 40 and weight ≥ 55 kg</td>
<td>Enoxaparin 40 mg SQ every 24 hours or Enoxaparin 30 mg SQ every 12 hours or Dalteparin 5,000 units SQ every 24 hours or Heparin 5,000 units SQ every 8 hours or Fondaparinux 2.5 mg SQ every 24 hours or Rivaroxaban 10 mg PO every 24 hours or Apixaban 2.5 mg PO every 12 hours</td>
</tr>
<tr>
<td>Patient with BMI ≥ 40 kg/m²</td>
<td>Enoxaparin 40 mg SQ every 12 hours or Heparin 7,500 units SQ every 8 hours</td>
</tr>
<tr>
<td>Patient with weight &lt; 55 kg</td>
<td>Enoxaparin 30 mg SQ every 24 hours or Heparin 5,000 units SQ every 8-12 hours</td>
</tr>
</tbody>
</table>

1 Contraindicated if total body weight < 50 kg and/or CrCl < 30 mL/minute
2 Check for drug interactions prior to use
3 Both apixaban and rivaroxaban should be avoided in patient with severe liver dysfunction (Child Pugh score C). Rivaroxaban is contraindicated with Child Pugh score B and apixaban should be used with caution.

**Note:** Currently apixaban and rivaroxaban are indicated for VTE prophylaxis in patients undergoing knee or hip replacement surgery. Rivaroxaban is also indicated in medical patients who are not at high risk of bleeding. There is limited data to support apixaban or rivaroxaban use if patients with CrCl <30 ml/min as these patients were excluded from the trials for VTE prophylaxis. Both apixaban and rivaroxaban appear to be safe and effective compared to warfarin in patients being treated for non-valvular atrial fibrillation with end stage renal disease and can be considered for VTE prophylaxis in this population.
## APPENDIX F: Spinal Procedure and/or Epidural Placement Management

### Neuraxial catheters

The following medications and doses can be given while a neuraxial catheter is in place. Higher dosages or alternative medications must obtain approval from Acute Pain service.

- Enoxaparin $\leq 40$ mg SQ every 24 hours
- Heparin $\leq 5,000$ units SQ every 8 hours

Hold times prior to catheter removal or placement:

- Heparin¹: No time restrictions
- Enoxaparin with CrCl $\geq 30$ ml/min: 12 hours
- Enoxaparin with CrCl $< 30$ ml/min: 24 hours

Hold time after catheter removal or placement:

- Heparin¹: No time restrictions
- Enoxaparin: 4 hours after catheter removal and 8 hours after catheter placement

¹ Only for heparin dosing $\leq 5,000$ SQ every 8 hours
APPENDIX G: Risk Factors for Major Bleeding Complications in Surgical Patients

**General Risk Factors**
- Active bleeding
- Previous major bleeding
- Known, untreated bleeding disorder
- Severe renal or hepatic failure
- Thrombocytopenia
- Acute stroke
- Uncontrolled systemic hypertension
- Lumbar puncture, epidural, or spinal anesthesia within previous 4 hours or next 12 hours
- Concomitant use of anticoagulants, antipletlet therapy, or thrombolytic drugs

**Procedure-specific risk factors**
- Abdominal surgery
  - Male sex, preoperative hemoglobin level < 13 g/dL, malignancy, and complex surgery defined as two or more procedures, difficult dissection, or more than one anastamosis
- Pancreaticoduodenectomy
  - Sepsis, pancreatic leak, sentinel bleed
- Hepatic resection
  - Number of segments, concomitant extrahepatic organ resection, primary liver malignancy, lower preoperative level, and platelet counts
- Cardiac surgery
  - Use of aspirin
  - Use of clopidogrel within 3 days before surgery
  - BMI > 25 kg/m², nonelective surgery, placement of five or more grafts, older age
  - Older age, renal insufficiency, operation other than CABC, longer bypass time
- Thoracic surgery
  - Pneumonectomy or extended resection

**Procedures in which bleeding complications may have especially severe consequences**
- Craniotomy
- Spinal surgery
- Spinal trauma
- Reconstructive procedures involving free flap

---

**APPENDIX H: IMPEDE VTE Score**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Point Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMiD therapy</td>
<td>+ 4</td>
</tr>
<tr>
<td>BMI ( \geq 25 \text{ kg/m}^2 )</td>
<td>+ 1</td>
</tr>
<tr>
<td>Pelvic, hip, or femur fracture</td>
<td>+ 4</td>
</tr>
<tr>
<td>Erythropoiesis-stimulating agent</td>
<td>+ 1</td>
</tr>
<tr>
<td>Dexamethasone (regimen dose)</td>
<td>+ 2</td>
</tr>
<tr>
<td>Low dose (( \leq 160 \text{ mg/month} ))</td>
<td>+ 4</td>
</tr>
<tr>
<td>High dose (( &gt; 160 \text{ mg/month} ))</td>
<td></td>
</tr>
<tr>
<td>Doxorubicin</td>
<td>+ 3</td>
</tr>
<tr>
<td>Ethnicity/Race = Asian/Pacific Islander</td>
<td>- 3</td>
</tr>
<tr>
<td>History of VTE before multiple myeloma diagnosis</td>
<td>+ 5</td>
</tr>
<tr>
<td>Tunneled line of central venous catheter</td>
<td>+ 2</td>
</tr>
<tr>
<td>Existing thromboprophylaxis: Therapeutic LMWH of warfarin</td>
<td>- 4</td>
</tr>
<tr>
<td>Existing thromboprophylaxis: prophylactic LMWH or aspirin</td>
<td>- 3</td>
</tr>
</tbody>
</table>

IMiD = immunomodulatory drug
Venous Thromboembolism (VTE) Prophylaxis for Adult Patients

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SUGGESTED READINGS


Continued on next page
SUGGESTED READINGS - continued


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DEVELOPMENT CREDITS

This practice consensus algorithm is based on majority expert opinion of the VTE workgroup at the University of Texas MD Anderson Cancer Center for the patient population. These experts included:

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† Core Development Team Lead
♦ Clinical Effectiveness Development Team