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Venous Thromboembolism (VTE) Prophylaxis for Adult Patients

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**INITIAL EVALUATION**

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

**VTE RISK**

- **MODERATE RISK**
  - Patients with one or more VTE risk factors

- **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

**MANAGEMENT**

- **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.

- **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.

- **Ambulation and**
  - Optional SCD and/or TED hoses

- If neuraxial catheter planned or in place, see Appendix C in the Peri-Procedure Management of Anticoagulants algorithm

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**

**SURGICAL HOSPITALIZED PATIENTS**

<table>
<thead>
<tr>
<th>VTE RISK</th>
<th>MANAGEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HIGH RISK</strong></td>
<td></td>
</tr>
<tr>
<td>- Major(^1) surgery for cancer with one or more VTE risk factors(^1) other than active cancer</td>
<td></td>
</tr>
<tr>
<td>- Abdominal or pelvic surgery for cancer</td>
<td></td>
</tr>
<tr>
<td>- Major orthopedic surgery for cancer</td>
<td></td>
</tr>
<tr>
<td>Does patient have contraindications to pharmacologic prophylaxis(^6,7)?</td>
<td></td>
</tr>
<tr>
<td>SCD(^5)</td>
<td>Yes</td>
</tr>
<tr>
<td>- Pharmacological prophylaxis(^6,7) and SCD(^5)</td>
<td></td>
</tr>
<tr>
<td>- If neuraxial catheter planned or in place, see Appendix C in the Peri-Procedure Management of Anticoagulants algorithm</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

| **MODERATE RISK**    |            |
| - Major\(^1\) surgery for cancer with no additional VTE risk factors\(^1\) |
| Does patient have contraindications to pharmacologic prophylaxis\(^6,7\)? |
| SCD\(^5\)            | Yes        |
| - Pharmacological prophylaxis\(^6,7\) and Optional SCD\(^5\) |
| - If neuraxial catheter planned or in place, see Appendix C in the Peri-Procedure Management of Anticoagulants algorithm |
| No                   |            |

| **LOW RISK**         |            |
| - Minor\(^8\) general and orthopedic surgery with expected length of stay < 24 hours |
| Does patient have contraindications to pharmacologic prophylaxis\(^6,7\)? |
| SCD\(^5\)            | Yes        |
| - Ambulation and Optional SCD\(^5\) |
| No                   |            |

**SCD** = sequential compression device

1 See Appendix A for VTE Risk Factors

2 See Appendix F 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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Venous Thromboembolism (VTE) Prophylaxis for Adult Patients

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**INITIAL EVALUATION**

Assess for VTE risk factors¹ and bleeding risk² as clinically indicated

**VTE RISK**

- Multiple myeloma on immuno-modulatory drug (IMiD) regimens and no contraindications³
- Starting a new chemotherapy regimen with a low risk of bleeding and no contraindications³
- High risk outpatients with low risk of bleeding and no contraindications³
- High risk cancer types: pancreas, stomach, bladder, gynecologic, lung, lymphoma, testicular

**MANAGEMENT**

- IMPEDE score⁴
  - > 3: High risk – recommend pharmacologic prophylaxis⁵,⁶
  - ≤ 3: Low risk – recommend no pharmacologic prophylaxis or aspirin
- Khorana score⁷
  - ≥ 2: Consider and discuss with patient pharmacologic thromboprophylaxis⁵,⁶ for up to 6 months or longer, if risk persists
  - < 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 prophylaxis⁵,⁶

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 ≥ 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 G 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

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Approved by the Executive Committee of the Medical Staff on 04/18/2023
## APPENDIX A: VTE Risk Factors

- Active cancer (or suspicion of cancer); excludes basal/squamous cell skin 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
- Treatment factors (chemotherapy, protein kinase inhibitors, immunotherapy and/or antiangiogenic agents)
- Exogenous estrogen compounds (hormone replacement, contraceptives, tamoxifen/raloxifene, diethylstilbestrol)
- Erythropoietin stimulating agents
- Poor performance status
- Nephrotic syndrome
- Major trauma
- Spinal cord injury
- Smoking, tobacco use
- Obesity (BMI > 30 kg/m²)
- 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
### 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 bleed
- Recent neurosurgery
- Intracranial or spinal lesion at high risk of bleeding
- Underlying coagulopathy or known bleeding disorder in the absence of replacement therapy (e.g. hemophilia, Von Willebrand Disease)
- 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.
## APPENDIX D: Pharmacological Options for VTE Prophylaxis

<table>
<thead>
<tr>
<th>Patient Group</th>
<th>Medication Regimen</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 factors other than active cancer</td>
<td>• Enoxaparin 40 mg SQ every 24 hours or Heparin 5000 units SQ every 8 hours • 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. • For management of patients currently on prophylaxis, see institutional algorithm</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 basis.</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 • Add SCDs during hospital stay</td>
<td></td>
<td>• Extended to total of 28 days</td>
</tr>
<tr>
<td>Moderate risk - Major surgery for cancer with no additional VTE risk factors</td>
<td>• Enoxaparin 40 mg SQ every 24 hours or Heparin 5000 units SQ every 8 hours • 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 • Add SCDs during hospital stay</td>
<td>• Start 12 hours or more preoperatively or 12 hours or more postoperatively • For management of patients currently on prophylaxis, see institutional algorithm</td>
<td>Minimum 10-14 days; extended to 30 days recommended • 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 factors</td>
<td>• SCDs alone for at least 24-48 hours • 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></td>
<td>For management of patients currently on prophylaxis, see institutional algorithm</td>
</tr>
<tr>
<td>High risk - One or more VTE risk factors other than active cancer</td>
<td></td>
<td></td>
<td>None</td>
</tr>
</tbody>
</table>

1 This section includes first line options. Additional pharmacologic prophylaxis options and dosing for renal dysfunction can be seen in Appendix E.
2 See Appendix A for VTE Risk Factors
3 For more information on peri-procedure management of anticoagulants, see Peri-Procedure Management of Anticoagulants algorithm
4 Enoxaparin or apixaban may be utilized for extended duration prophylaxis at hospital discharge. For concerns regarding affordability, consider submitting a test claim 48 hours prior to discharge via Pecon (for internal use only).

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## APPENDIX D: Pharmacological Options for VTE Prophylaxis - continued

<table>
<thead>
<tr>
<th>Patient group</th>
<th>Medication Regimen</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**  
● Heparin 5000 units SQ every 8 hours | See institutional algorithm | See Ambulatory Cancer Patients on **Page 4** |
| Patients intolerant to heparin products or those who prefer to avoid pork products | ● Fondaparinux 2.5 mg SQ every 24 hours **or**  
● Rivaroxaban 10 mg every 24 hours **or**  
● Apixaban 2.5 mg PO every 12 hours | See institutional algorithm | See Ambulatory Cancer Patients on **Page 4** |

| **Ambulatory Cancer Patients** | | | |
| Multiple Myeloma patients receiving IMiD (i.e., thalidomide or lenalidomide) | **High Risk:**  
● Enoxaparin 40 mg SQ every 24 hours **or**  
● Rivaroxaban 10 mg every 24 hours **or**  
● Apixaban 2.5 mg PO every 12 hours | See institutional algorithm | Continue while on immunomodulatory drugs |
| | **Low Risk:**  
● No prophylaxis **or**  
● Aspirin 81-325 mg PO every 24 hours | | |
| | ● Khorana score ≥ 2 prior to starting a new chemotherapy regimen **or**  
● High risk outpatients | ● Enoxaparin 40 mg SQ every 24 hours **or**  
● Rivaroxaban 10 mg PO every 24 hours **or**  
● Apixaban 2.5 mg PO every 12 hours | See institutional algorithm | Continue for 6 months or longer, if risk persists then reassess |

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

5 Prior to discharge, ensure patient can afford their medication. For concerns regarding affordability, consider submitting a test claim 48 hours prior to discharge via Pecon (for internal use only)
## APPENDIX E: Dosing Recommendations for Renal Impairment, Obesity, and Underweight Patients

### Creatinine Clearance

<table>
<thead>
<tr>
<th>Patient Population</th>
<th>CrCl &gt; 30 ml/min</th>
<th>CrCl 20-30 ml/min</th>
<th>CrCl &lt; 20 ml/min / dialysis</th>
</tr>
</thead>
<tbody>
<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>
<td>Enoxaparin 30 mg SQ every 24 hours or Heparin 5,000 units SQ every 8 hours or Rivaroxaban 10 mg PO every 24 hours or Apixaban 2.5 mg PO every 12 hours</td>
<td>Heparin 5,000 units SQ every 8 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>
<td>Heparin 7,500 units SQ every 8 hours</td>
<td></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>
<td>Heparin 5,000 units SQ every 8-12 hours</td>
<td></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: 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 CABG, 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 G: 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 ≥ 25 kg/m²</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 (≤ 160 mg/month)</td>
<td>+ 4</td>
</tr>
<tr>
<td>High dose (&gt;160 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
SUGGESTED READINGS


Department of Clinical Effectiveness V9
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continued on next page
SUGGESTED READINGS - continued


Venous Thromboembolism (VTE) Prophylaxis for Adult Patients

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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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