VTE Prophylaxis in Trauma Patients

Purpose

Venous thromboembolism (VTE), in the form of either deep vein thrombosis (DVT) or pulmonary embolism (PE), can result in significantly increased morbidity and mortality for patients. Trauma patients, in particular, are at increased risk for development of VTE due to a prothrombotic state created by the traumatic event, injuries sustained, and resulting impaired mobility. This practice guideline is to provide guidance on preventing VTE in the trauma patient population.

Risk Stratification

Low Risk	• Expected length of stay less than 48 hours • Patients in observation status • Patients no longer (or never) ill who are awaiting disposition • Ambulating cancer patient admitted for short stay chemo infusion • Ambulating patients not meeting criteria for **moderate or high risk** (trauma patients very rarely are in this group)
Moderate Risk	• Moderate/major surgery with impaired mobility • Moderate/major surgery with any VTE risk factor* • Active cancer with acute medical illness, reduced mobility, or other VTE risk factors • Medical/surgical patient with reduce mobility and acute illness • Medical/surgical patient with prior history of VTE

High Risk	• Orthopedic joint/bone surgery in pelvis or lower extremity • Major orthopedic trauma • Surgery of abdominal or pelvic cancers • Critically ill patients in the ICU • Acute spinal cord injury with paresis • Craniotomy surgery • Spinal surgery for cancer or spinal fusion • Major Trauma victims (presence of >1 of following): o ISS>15 o GCS<9 for more than 4 hours o Lower extremity fractures o Multiple spine fractures o Major pelvic fracture o Multiple (>3) long bond fractures (>/= 1 in the lower extremity) o Spinal cord injury with paraplegia or quadriplegia o Laparotomy, thoracotomy, or laparoscopy o Co-morbid risk factors* including prior history of DVT/PE, obesity, known sepsis, malignancy, hypercoagulable state, and pregnancy.

VTE Risk Factors:

1. Age greater than 50
2. History of prior VTE
3. History of myocardial infarction
4. History of cancer
5. History of atrial fibrillation
6. History of ischemic stroke
7. History of diabetes mellitus
8. History of congestive heart failure
9. History of obesity
10. History of paralysis
11. History of varicose veins
12. Use of hormone replacement therapy
13. History of inhibitor deficiency state:
    - Factor V leiden
    - Prothrombin gene mutation
    - Protein S deficiency
    - Protein C deficiency
    - Antithrombin III deficiency
    - Anticardiolipin antibodies

Diagnosis of VTE

- Given the increased risk of VTE in trauma patients, the clinician must always maintain a **high index of suspicion.**
- Physical exam findings:
    - PE: tachycardia, tachypnea, mental status changes, diaphoresis
    - DVT: extremity pain, fever, localized edema/swelling of the extremity, warmth/erythema of the extremity
- Lab and Radiology findings:
    - Arterial blood gas—respiratory alkalosis, hypoxemia
    - Chest x-ray—nonspecific, peripheral wedge defect
    - Extremity duplex—occlusive/non-occlusive thrombosis
    - CTA chest—filling defect(s)
    - Echocardiography—impaired right ventricular function, intraventricular septum bulging into the left ventricle, dilated proximal pulmonary arteries, elevated right atrial pressure, elevated pulmonary artery pressure

VTE Prophylaxis Practice Management Guidelines for Trauma Patients

- Mechanical VTE prophylaxis
    - All trauma patients, unless otherwise specified, should receive mechanical VTE prophylaxis with sequential compression devices (SCDs), injury permitting.
    - SCDs should be worn while the patient is in bed or nonambulatory and may be removed when the patient is out of bed or ambulating.
    - If the patient has sustained a lower extremity injury or has a known VTE in the lower extremity, a SCD should not be placed on the affected extremity.

- Pharmacologic VTE prophylaxis
    - Enoxaparin is the preferred prophylaxis in trauma patients, as there are several studies showing superiority to unfractionated heparin in this patient population.
    - All trauma patients, unless otherwise specified, should receive enoxaparin (Lovenox) dosed appropriately for weight every 12 hrs within 24 hrs of admission.
    - If enoxaparin is contraindicated (renal insufficiency, history of HIT, etc), other options for pharmacologic prophylaxis include heparin or fondaparinux Please consult with the trauma attending and/or pharmacist if alternative VTE prophylaxis is being considered.
    - VTE prophylaxis should not be held for operative procedures unless requested by the surgical attending.

- Weight Based Enoxaparin Dosing for VTE Prophylaxis in Trauma Patients:
    - **BMI < 30:**
        - Enoxaparin 30mg subcutaneous every 12 hours
        - CrCl < 30 mL/min or renal replacement therapy: Heparin 5000units subcutaneous every 8 hours
    - **BMI ?30**
        - Enoxaparin 0.5mg/kg subcutaneous every 12 hours
        - CrCl <30mL/min or renal replacement therapy: Heparin 7500 units subcutaneous every 8 hours

- Utilize the pharmacist to assist with adjusting dose based on patient BMI, renal function, and anti-Xa levels.

Exceptions to VTE Prophylaxis Practice Managment Guidelines For Trauma Patients

- ○ Traumatic Brain Injury
    - VTE prophylaxis should be initiated within 48 hours following injury/procedure for patients with intracranial hemorrhages and after craniotomy unless CT head is not yet stable or otherwise stated by neurosurgical attending.
    - VTE prophylaxis should be initiated 24 hours following last stable CT head unless specifically requested by the neurosurgical attending.
    - **TBI patients should initially be placed on enoxaparin 30 mg q12 hrs regardless of BMI with subsequent dose adjustments based on Anti-Xa levels.**
    - For patients with TBI requiring placement of an intracranial pressure (ICP) monitor, he/she should receive VTE prophylaxis with either enoxaparin 40 mg daily or heparin 5000 units q8hrs. After removal of the ICP monitor, prophylaxis should be changed back to enoxaparin dosed q12hrs.
    - HOLD VTE prophylaxis 12 hours prior to removal of ICP monitor or EVD.

- Spinal cord injury
    - VTE prophylaxis should be initiated on admission on those patients with a stable spinal cord injury requiring no surgical fixation.
    - For patients requiring operative intervention for spinal cord injury, VTE prophylaxis should be initiated within 72 hours unless specifically requested to be held by the spine surgeon.
        - § VTE prophylaxis should be held the morning of surgery and 48 hrs post-operatively initiate enoxaparin 40 mg daily for 5 days then transition to enoxaparin dosed appropriately for weight q12hrs.
    - For patients with spinal drain in place, he/she should receive VTE prophylaxis with enoxaparin 40 mg daily. After removal of the spinal drain, prophylaxis should be changed back to enoxaparin dosed appropriately for weight q12hrs.

- Solid organ injury with non-operative management
    - VTE prophylaxis should be initiated within 48 hours of admission for most solid organ injuries, unless specifically requested by the trauma attending.

- Pelvic fractures with active extravasation
    - VTE prophylaxis should be initiated within 24 hours of admission for most pelvic fractures with active extravasation, unless specifically requested by the trauma attending.
- Patients presenting in hemorrhagic shock
    - VTE prophylaxis should be initiated within 24 hrs of obtaining hemorrhage control, unless specifically requested by the trauma attending.

- Significant coagulopathy

- VTE prophylaxis should be initiated within 24 hrs of correcting coagulopathies, unless specifically quested by the trauma attending.
- Presence of underlying hepatic insufficiency resulting in ongoing coagulopathies may require the use of alternative pharmacologic VTE prophylaxis and should prompt a discussion between the trauma team and pharmacy.

- Epidural Placement
  - Enoxaparin should be held 12 hours prior to epidural placement or removal.
  - Enoxaparin should be held 4 hours following epidural removal.
  - While the epidural is in place, enoxaparin should be dosed at 40 mg daily. Once epidural is removed, enoxaparin may be adjusted to the appropriate weight based dose q12hrs.
  - Refer to MP02-Neuroaxial Procedure Policy for additional information.

- Renal Insufficiency
  - For patients with a creatinine clearance <30mL/min, enoxaparin may be renally adjusted to 30mg daily or subcutaneous heparin dosed appropriately for weight q8hrs
  - In patients receiving renal replacement therapy, subcutaneous heparin is recommended over enoxaparin.

- Pediatric patients
  - Pediatric patients >15 yrs of age or younger patients in a postpubertal state and an ISS>25 should receive VTE prophylaxis with sequential compression devices (SCDs), injury permitting, and enoxaparin dosed appropriately for weight q12 hrs.
  - Prepubescent patients <15 yrs of age should not routinely receive VTE prophylaxis.

LMWH Anti-Xa Level Monitoring

- Peak Anti-Xa levels will be drawn on the following trauma patients:
  - Traumatic brain injuries with intracranial hemorrhage
  - Orthopedic injuries requiring total joint replacements
  - Patients with spinal cord injury
  - Spine fractures requiring surgical fixation
  - Renal insufficiency with creatinine clearance <50 ml/min or age >75 yrs.
  - Prolonged ICU stay of 7 days or greater
- In these patients, the “Inpatient consult to pharmacist – Anticoagulation Other” order should be placed in EPIC. A pharmacist will assist in ordering levels at appropriate times, monitoring drug levels and adjusting dosages of medication as indicated.

- Peak Anti-Xa levels should be drawn 4 hours following the administration of enoxaparin. These labs should be ordered after the third or fourth dose of enoxaparin.
  - Goal prophylaxis peak range is 0.2 to 0.4 IU/mL.
  - Once the goal range is reached, no further monitoring is needed unless there is a change in the patient’s renal function (creatinine clearance).
  - If the patient is not within the goal range and Anti-Xa level deemed to be drawn at appropriate time, the dose of enoxaparin may be adjusted up or down based on the desired effect.

Screening Measures for Trauma Patients

- VTE screening is not performed routinely in our trauma patients.
- Given the increased risk of VTE in trauma patients, the clinician must always maintain a **high index of suspicion.**
- If VTE is suspected, the initial study of choice is a lower extremity ultrasound with additional imaging/work-up as clinically indicated.

IVC Filter Placement

- Indications for a therapeutic IVC filter placement include patients with known PE or lower extremity DVT and a contraindication, failure or complication of anticoagulation.
- A prophylactic IVC filter may be considered in patients with the following:
    - Spinal cord injury with paraplegia or quadriplegia
    - IVC, iliac, or femoral venous ligation or repair
    - Severe pelvic fracture with lower extremity long bone fracture
    - AIS head >/=3 with contraindication to anticoagulation
    - High risk patients with contraindication, failure or complications of anticoagulation.

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Last Updated

July 2025

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Revision #3
Created 18 August 2023 19:03:42 by Emily Cantrell
Updated 16 July 2025 16:54:08 by Abby Josef