VANDERBILT UNIVERSITY
MEDICAL CENTER

**DIVISION OF TRAUMA & SURGICAL CRITICAL CARE**

# Practice Management Guidelines for Venous Thromboembolism Prophylaxis

## I. Purpose

To prevent pulmonary embolism (PE) and deep vein thrombosis (DVT) in trauma patients

## II. Risk Factor Categories

| Risk Factors | High Risk Factors | Very High Risk Factors |
|---|---|---|
| • Age > 40 years<br>• ISS > 9<br>• Blood transfusions<br>• Surgical procedure within 72 hrs<br>• Immobilization<br>• Malignancy<br>• Extensive soft tissue trauma<br>• Hormone therapy<br>• Obesity<br>• AIS ≥ 3 (any region) | • Age > 60 years<br>• ISS > 15<br>• GCS < 9 for > 4 hours<br>• Major venous injury/repair<br>• PMH of venous thromboembolism (VTE)<br>• Lower extremity fracture<br>• Multiple spinal fractures<br>• Pregnancy | • Spinal cord injury with paraplegia or quadriplegia<br>• Complex or multiple (≥ 2) lower extremity fractures<br>• Major pelvic fracture<br>• Multiple (≥ 3) long bone fractures (≥ 1 in the lower extremity)<br>• Age ≥ 75 years with any high risk factor |

## III. Physical Exam Findings

A. PE- tachycardia, tachypnea, MS changes, diaphoresis
B. DVT- extremity pain, fever, localized edema/swelling, warmth/erythema

## IV. Lab and Radiology Findings

A. Blood gas – respiratory alkalosis, hypoxemia
B. CXR – nonspecific, peripheral wedge defect
C. Extremity Duplex – occlusive/non-occlusive thrombosis
D. CT angio Chest – filling defect(s)

## V. VTE Prophylaxis Protocol for Trauma Patients

A. All trauma patients, unless otherwise specified, should receive VTE prophylaxis with at least enoxaparin (Lovenox) 30 mg SQ Q 12 hr within 24 hrs of admission (see Obesity and Weight-Based Dosing).
    a. VTE prophylaxis should NOT be held for patients with an elevated baseline INR due to liver dysfunction.
*B. No doses of enoxaparin will be held for operative procedures with the exception of spine and neurosurgical operative cases or unless requested by the attending.*

## VI. Exceptions to VTE Prophylaxis Protocol

**Traumatic brain and spinal cord injury**

A. VTE prophylaxis will be initiated within 72 hrs of the injury/procedure for most intra-cranial hemorrhages and after craniotomy.
B. Prophylaxis may be considered 24 hrs after admission for patients with mild TBI and the following:
    a. GCS of 15 within 30 minutes of injury
    b. Subdural or epidural hematoma < 5mm and a repeat CT demonstrating stability.
    c. Contusion or intraventricular hemorrhage < 2 cm (single lobe only) and a repeat CT demonstrating stability.
C. Start VTE prophylaxis 24 hours after admission for patients with a minimal TBI (see minimal TBI pathway)
D. Patients with an intraspinal hematoma should have VTE prophylaxis started within 48 hours of admission unless otherwise specified by the Ortho Spine or Neuro Spine teams.
E. For patients requiring an operative spine intervention, VTE prophylaxis should be held the morning of surgery and may be resumed 24 hrs post-operatively unless otherwise specified by the operating team.
F. Enoxaparin is preferred in these patient populations, as well. However, patients with one of the above conditions and an ICP monitor, extraventricular drain, or spinal drain in place should receive heparin 5000 units Q 8 hrs. After removal of the ICP monitor or drain, patients should be changed to enoxaparin 30 mg Q 12 hrs or appropriate weight-based dosing.

**Epidural Placement**

G. Enoxaparin will not be used 12 hours prior to epidural placement, while the catheter is indwelling, or for 4 hours after removal.
    a. Heparin 5000 units Q 8 hrs and SCDs may be substituted for enoxaparin during the indwelling time.

**Renal Impairment**

H. For patients with a significant rise in SrCr (> 50%) or a creatinine clearance < 30 mL/min, enoxaparin may be renally adjusted to 30 mg daily or subcutaneous heparin 5000 units Q 8 hrs may substituted for enoxaparin.
    a. In patients on renal replacement therapy, heparin 5000 units Q 8 hrs is recommended over enoxaparin.

**Obesity and Weight-Based Dosing**

| Current patient weight | Enoxaparin initial dose |
|---|---|
| 90 – 129 kg | 40 mg q12h |
| 130 – 179 kg | 60 mg q12h |
| ≥ 180 kg | 80 mg q12h |

I. If receiving subcutaneous heparin, patients with a BMI ≥ 40 kg/$m^2$ and who do not have an epidural in place, a higher dose of 7500 units q8h is recommended.

## VII. LMWH Anti-factor Xa (Anti-xa) Level Monitoring

A. An Anti-xa level should be drawn in patients with the following characteristics:
   a. Weight ≥ 90 kg
   b. All patients in the very high risk factor group
B. Anti-xa level peaks should be drawn 4 hours after the administration of enoxaparin. These labs should be ordered after the third dose of enoxaparin.
   a. To order in Epic: LMW Heparin Assay (must time correctly)
   b. Goal peak is 0.2 to 0.4 IU/mL.
      i. If Anti-xa level is drawn appropriately and below the goal range, increase the dose to the next syringe size.
   c. Once the goal range is reached, no further monitoring needed

## VIII. Surveillance

**a.** Routine lower extremity duplex ultrasound should be completed 72 hrs after admission and weekly thereafter in patients who are in the very high risk factor group.

## IX. IVC Filter Placement

A. Refer to IVC filter protocol (see Procedures Section at http://www.traumaburn.com/mdprotocolstyle.htm)
   a. A *prophylactic* IVC filter may be considered in patients with paraplegia or quadriplegia; IVC, iliac, or femoral venous ligation/repair; severe pelvic fracture with lower extremity long bone fracture; AIS head ≥ 3 with contraindication to anticoagulation; or high risk patients with contraindication, failure, or complications of anticoagulation.
   b. Indications for a *therapeutic* IVC filter include patients with known PE or lower extremity DVT and contraindication, failure, or complication of anticoagulation, among other indications.

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