Parent Policy: InsertLinkToParentPolicy	Title: VTE Guideline for Surgery & Trauma Patients	Standard Operating Procedure Effective Date: 12/22/2021

Background: Venous thromboembolism (VTE) is a major cause for morbidity and mortality among surgery and trauma patients, and enoxaparin has been proven to be the preferred chemoprophylaxis agent in preventing VTE events.[1] Furthermore, weight-based enoxaparin dosing strategies have been shown to decrease the rates of VTE events among surgery and trauma patients.[2–5] Anti-factor Xa levels can be used to optimize enoxaparin dosing in certain high-risk patients to further reduce risk of VTE events and bleeding complications.[6–8] This guideline is meant for patients age 18 years or older. Consideration for use in pediatric patients should be discussed in collaboration with consultative and pediatric teams.

Collaborations: Orthopedics, Neurosurgery, Pharmacy

Guidelines/Process:

I. Weight based enoxaparin with twice daily dosing is the preferred agent for VTE chemoprophylaxis in surgery and trauma patients without end-stage renal disease.
   a. <80kg: Enoxaparin 30mg sq bid
   b. 80-120kg: Enoxaparin 40mg sq bid
   c. >120kg: Enoxaparin 50mg sq bid

II. The following patients are considered high risk for major morbidity related to bleeding complications:
   a. Traumatic intracranial hemorrhage, or
   b. Spinal canal hemorrhage, or
   c. High risk solid organ injury (grade 4-5 or active extravasation) managed without surgery or angioembolization

   When appropriate a starting dose of enoxaparin 30mg twice daily should be used **regardless of weight** in the above patients, and a pharmacy consult to ensure an anti-factor Xa level is ordered at steady state and to assist with subsequent dose adjustments.

III. Dosing adjustments may be necessary in certain patients at high risk for VTE (e.g., morbid obesity, multiple long-bone fractures, known malignancy). Monitoring of anti-Xa levels and appropriate enoxaparin dose adjustment may be necessary with involvement of pharmacy services on case-by-case basis.

IV. Unfractionated heparin (5000 units sq every 8 hours) is the preferred agent for VTE chemoprophylaxis in patients who have end-stage renal disease or a creatinine clearance <30. Increased doses of unfractionated heparin (ie…7500 units) in elevated BMI patients have not shown benefit for VTE prevention but have been shown to increase the risk for bleeding; therefore, should not be used.[9]

V. Contraindications to starting/continuing VTE chemoprophylaxis include the following:[10,11]
   a. Any injury associated with hemodynamic abnormality, ongoing transfusion requirement or falling hemoglobin.
   b. Solid organ injuries deemed high risk for ongoing hemorrhage:
      i. Grade II & III injuries (hold for 24hrs)
      ii. Grade IV & V injuries (hold for 48hrs)
      iii. Active extravasation
      iv. Large volume hemoperitoneum
      v. Significant decrease in hemoglobin (1g/dL over 24 hours)

      NOTE: VTE chemoprophylaxis can be started immediately after angioembolic or surgical control of bleeding and clinical evidence of hemostasis.
   c. High risk intracranial hemorrhage (timing of VTE chemoprophylaxis in collaboration with neurosurgery service, please refer to "Neurosurgical emergencies" guideline for more info).[12]

d. High risk spinal canal hemorrhage (decision on timing of VTE chemoprophylaxis in collaboration with neurosurgery or orthopedic spine service).
e. Post-operative patients who underwent cranial or spine surgery (decision on timing of VTE chemoprophylaxis in collaboration with neurosurgery or orthopedic spine service).
f. Patients on anticoagulation in preinjury setting (decision on timing of VTE chemoprophylaxis in collaboration with pharmacy and after accurate home medication reconciliation).

VI. Among **hemodynamically normal** patients, the following injuries would NOT warrant holding VTE chemoprophylaxis
a. Low-risk intracranial hemorrhage (as determined in collaboration with neurosurgery service)[12]
b. Hemothorax or pulmonary contusions
c. Long bone fractures
d. Chest wall or abdominal wall hematomas
e. Pelvic fractures, with or without retroperitoneal hematoma
f. Blunt cerebrovascular injuries, with or without pseudoaneurysm formation
g. Patients postoperative from abdominal or thoracic surgery

NOTE: Exceptions will exist and are determined on case-by-case basis by the attending surgeon.

VII. Holding of VTE chemoprophylaxis for orthopedic surgeries:
a. Enoxaparin should be held 12 hours before orthopedic surgery
b. Enoxaparin should be re-started no more than 2 hours post-orthopedic surgery
c. The following orthopedic procedures do not require holding VTE chemoprophylaxis
i. Upper extremity surgeries distal to mid-forearm
ii. Foot and ankle surgeries
iii. Percutaneous surgeries
iv. External fixator placement/adjustment of upper extremity or below the knee
d. Sometimes operative plans are more extensive than the OR posting suggests, communication between the orthopedic and trauma service will ensure VTE prophylaxis is held appropriately for each individual case.

VIII. VTE prophylaxis should not be held either pre- or post- operatively for general surgery cases unless specifically requested by the attending surgeon.

IX. All patients will utilize SCDs if not contraindicated; these devices are supplemental and are not considered adequate by themselves for VTE prophylaxis in trauma patient populations.

X. Patients with major orthopedic and/or spinal cord injuries are at high risk for VTE complications post-discharge.
a. All lower extremity orthopedic injuries at the knee level or above indicates aspirin 325mg PO twice daily for 4 weeks post-discharge.
b. Any lower extremity orthopedic injury that results in immobilization (ie. dependent on assistance for transfers) indicates enoxaparin 40mg SC once daily for 4 weeks post-discharge. Aspirin is not necessary unless prescribed for a different indication.
c. Individualized cost considerations as well as communication between the trauma and orthopedic services will ensure the optimal plan for each patient.

References:

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