Evidence-Based Practice in Preventing Venous Thromboembolism (VTE)

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Objectives

• Understand rationale for establishing a VTE prevention initiative

• Effectively construct a VTE protocol that incorporates:
  – Use of best practices for prophylaxis
  – Promotes standardization of the process
  – Decision support
  – Interdisciplinary team as a safety net

• Define strategies to engage the patient and family
Rationale for VTE Prophylaxis

• Clinically silent disease (only ~50% of cases are symptomatic)
• Death can occur within minutes after PE
• Often, no warning sign or time to implement effective intervention
• Routine surveillance with Doppler ultrasound is not practical or feasible (CHEST 2012 Grade 2C against)
• Long-term consequence have high morbidity, mortality and financial impact
• Anticoagulant treatment of VTE is potentially harmful, labor intensive and costly

VTE prevention helps avoid these issues
VTE Prevention in Hospitals
Current Practice

• At baseline, hospitals reported on their VTE prevention efforts:
  – The majority of participants did not have a standard practice for VTE prevention for their general medical population
  – Most hospitals report having a VTE protocol that is not being used accurately, if at all
  – If pharmaceutical and/or mechanical prophylaxis was ordered, it was not delivered at the appropriate time-point of care, or dosing was sub-therapeutic; or
  – Pharmaceutical or mechanical VTE prophylaxis may not be ordered at all, despite the patient risk factors
Challenges

• How do we identify patients who warrant VTE prevention measures?
• Which patients can benefit from pharmacologic prophylaxis?
• When may mechanical methods of prophylaxis be sufficient?
• How do we create a user-friendly protocol to guide practice?
• Once we address the above, how do we begin implementation and spread practice system-wide?
Action Steps

- Assess current practice
- Adopt a risk assessment
- Lay-out options for prophylaxis
- Standardize the process
- Provide decision support
- Include patient and family education
- Assess use of protocol frequently
Assess Current Practice

• Beginning January 2013 CMS will require data collection of the VTE measure set:
  – VTE 1 - VTE Prophylaxis
  – VTE 2 – ICU VTE Prophylaxis
  – VTE 3 – VTE Patients with Anticoagulant Overlap
  – VTE 4 – VTE Patients Receiving UFH with Monitoring by protocol/nomogram
  – VTE 5 – VTE Warfarin therapy discharge instruction
  – VTE 6 – Hospital-acquired potentially preventable VTE
# CMS Core Measure VTE Patient Populations

<table>
<thead>
<tr>
<th>Sub-population</th>
<th>VTE 1 VTE Prophylaxis</th>
<th>VTE 2 ICU VTE Prophylaxis</th>
<th>VTE 3 VTE Patients with AC Overlap</th>
<th>VTE 4 VTE Patients Receiving UFH with Monitoring protocol/nomogram</th>
<th>VTE 5 VTE Warfarin therapy discharge instruction</th>
<th>VTE 6 Hospital-acquired potentially preventable VTE</th>
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<td>Sub-population 2</td>
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<td>Sub-population 3</td>
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Included or excluded by the Principal and/or Other Diagnosis Codes. Cases will be included unless there are other exclusions.
Assess current practice

• Operational Readiness:
  – Must address current practices not to duplicate efforts
  – Collect all order-sets that address VTE
  – Review policy/procedure, order sets that include VTE prophylaxis, including nursing practice
  – Establish baseline data, if able
  – Determine who are the physician/pharmacy champion and other pertinent team members
### Assess current practice

#### Hierarchy of Reliability

**Table 4. Hierarchy of Reliability**

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<tr>
<th>Level</th>
<th>Predicted Prophylaxis Rate %</th>
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<td>1</td>
<td>No protocol (i.e., &quot;state of nature&quot;)</td>
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<td>2</td>
<td>Decision support exists but not linked to order writing or prompts exist within orders but no decision support at hand</td>
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<td>3</td>
<td>Protocol well-integrated into orders at point of care</td>
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<td>4</td>
<td>Protocol enhanced by other QI and high-reliability strategies</td>
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<tr>
<td>5</td>
<td>Oversights identified and addressed in real time</td>
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Standardize Care Processes

• Other considerations as you draft the VTE protocol:
  – Who will administer the assessment?
  – In what timeframe?
  – What transition points will the protocol be implemented?
  – Who will test the process?
Risk Assessment

• Review options for risk assessment/protocol
  – Simple 2-3 bucket model
• Assess all patients on admission
• Reassess patient at pivotal time points
  – Change in condition
  – Transition
• Hardwire use of the protocol into admission process
• Create a safety net with pharmacy/nursing
Review Options for Mechanical Prophylaxis

- Mechanical Prophylaxis
  - Graduated compression stockings (GCS) (e.g., “white hose”, TEDs)
  - Sequential compression devices
    - Venous foot pumps (currently recommended only for orthopedic surgery in patients with bleeding risk)

In most studies, less effective than pharmacologic prophylaxis and patient compliance rates are generally low.

Rates of compliance with mechanical forms of prophylaxis in many studies is less than 50% - has become a new target of malpractice litigation.

Bratzler, D (June 12, 2012). Presentation to New York State Hospital Providers
Graduated Compression Stockings (GCS)

- Anti-Embolism stockings
- Anti-thrombosis stockings
- Elastic support hose
- Graduated compression elastic stockings
- Jobst stockings
- Surgical hose
- TED hose (TEDs)
- White hose
- Thrombosis stockings
Review Options for Mechanical Prophylaxis

Intermittent Pneumatic Compression Device (IPC) AE pumps (anti-embolic pumps)-calf/thigh

- Alternating Leg Pressure (ALP)
- Athrombic pumps-calf/thigh
- Continuous Enhanced Circulation Therapy (CECT)
- DVT boots-calf/thigh
- EPC cuffs/stockings-External pneumatic compression-calf/thigh
- Flotron/Flotron DVT system-thigh
- Impulse pump-thigh
- Intermittent pneumatic compression stockings
- Intermittent compression device (ICD)
- KCI stockings
- Leg pumpers

- PAS (Pulsatile anti-embolic stockings)
- Plexipulse-calf/thigh
- Pneumatic intermittent impulse compression device
- Rapid inflation asymmetrical compression (RIAC) devices
- Sequential compression device
- Sequential pneumatic hose
- Thromboguard
- Thrombus pumps-calf/thigh
- Vascutherm
- VasoPress DVT System
- Venodyne boots-calf/thigh
Venous Foot Pumps (VFP)

- A-V impulse system
- Foot pump
- Kendall AV impulse (foot)
- Kendall boots
- Plantar venous plexus pump-foot only
- Plexiboots-foot only
- Pneumoboots-foot only
- SC boots-foot only
- SCD boots-foot only
- Venous foot
Lay-out Options for Pharmacological Prophylaxis

- Low-dose unfractionated heparin (LDUH)
- Low-molecular weight heparin (LMWH)
- Fondaparinux
- Direct inhibitors of activated factor X
  - rivaroxaban
- Direct thrombin inhibitors
  - dabigatran
- Warfarin
Standardize Care Processes

• Develop standard written order sets which link the risk assessment to the choice of prophylaxis
• Identify contraindications, both absolute and relative, and include them in order sets
• Allow for ‘opt-out’ as clinically indicated
Take Action

• What is your baseline performance?
• How should the team design the risk assessment and the order set?
• Who will administer the protocol?
  – Consider the physician, with support from nursing and pharmacy
• At what time points will it be administered?
  – Admission, post-op, transfer to CCU and discharge
Principles for Risk Assessment Development

• Principle 1. Keep it simple for the end user
• Principle 2. Do not interrupt workflow
• Principle 3. Design reliability into the process
• Principle 4. Pilot interventions on a small scale before attempting wide implementation
• Principle 5. Monitor use of the protocol
Pitfalls to Avoid

- Providing too much guidance: order sets can become too complicated
- Offering non-pharmacological options as a first line choice
- Link between risk level and prophylaxis choices are separated by space and time
- Failure to revise pre-existing and conflicting order sets
- Module vs. stand-alone orders
Case Identification

• Obtain list of patients on any anticoagulants:
  – Familiarize team with current practices associated
to AC use (recruit pharmacy and radiology to
assist with case identification)
  – Ask billing/finance department to pull cases based
on ICD-9 codes (take from tables 7.02, 7.03, and
7.04)
  – Random selection of patients currently on any
medical unit or ICU
Building a VTE Protocol: Draw the Line

Major Ortho

SCI, Mult Major trauma

Abd/pelvic CA undergoing OR

ICU, major med (CHF, vent, sepsis)

Major Surgery or moderate surgery w/risk factors

Moderate surgery without risk factors

Non-ICU pt - Less ill med patient with at least 1 risk factor

Ambulatory, 1 day surgery, no risk factors

LMWH (or Coumadin or Arixtra)

LMWH or UFH 5000 q 8h

UFH 5000 q 12h or UFH 5000 q 8h or LMWH

Education and Ambulation
Building a VTE Protocol: Draw the Line – Hospital A

Major Ortho
SCI, Mult Major trauma
Abd/pelvic CA undergoing OR

LMWH (or Coumadin or Arixtra)

ICU, major med (CHF, vent, sepsis)
Major Surgery or moderate surgery w/ risk factors
Moderate surgery without risk factors
Non-ICU pt - Less ill med patient with at least 1 risk factor

UFH 5000 q 12h or UFH 5000 q 8h or LMWH

Ambulatory, 1 day surgery, no risk factors
Education and Ambulation
Building a VTE Protocol: Draw the Line – Hospital B

**Major Ortho**
- LMWH (or Coumadin or Arixtra)

**SCI, Mult Major trauma**

**Abd/pelvic CA undergoing OR**
- LMWH or UFH 5000 q 8h

**ICU, major med (CHF, vent, sepsis)**
- LMWH or UFH 5000 q 8h

**Major Surgery or moderate surgery w/ risk factors**
- UFH 5000 q 12h or UFH 5000 q 8h or LMWH

**Moderate surgery without risk factors**

**Non-ICU pt - Less ill med patient with at least 1 risk factor**

**Ambulatory, 1 day surgery, no risk factors**
- Education and Ambulation
Aggressive VTE Protocol
A Strategy Favoring LMWH

Major Ortho
SCI, Mult Major trauma
Abd/pelvic CA undergoing OR
ICU, major med (CHF, vent, sepsis)
Major Surgery or moderate surgery w/ risk factors

Moderate surgery without risk factors
Non-ICU pt - Less ill med patient with at least 1 risk factor
Ambulatory, 1 day surgery, no risk factors

LMWH (or Coumadin or Arixtra)
LMWH or UFH 5000 q 8
UFH 5000 q 12h or UFH 5000 q 8h or LMWH
Education and Ambulation
More Aggressive VTE Protocol
A Strategy Favoring LMWH

- Major Ortho
- SCI, Mult Major trauma
- Abd/pelvic CA undergoing OR
- ICU, major med (CHF, vent, sepsis)
- Major Surgery or moderate surgery w/ risk factors
- Moderate surgery without risk factors
- Non-ICU pt - Less ill med patient with at least 1 risk factor

LMWH (or Coumadin or Arixtra)

- LMWH or UFH 5000 q 8
- UFH 5000 q 12h or UFH 5000 q 8h or LMWH

- Ambulatory, 1 day surgery, no risk factors
- Education and Ambulation
## 4 Bucket VTE Protocol

### More resolution (more complicated)

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<td>Non-ICU pt - Less ill med patient with at least 1 risk factor</td>
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<tr>
<td>Ambulatory, 1 day surgery, no risk factors</td>
<td>Education and Ambulation</td>
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Complete Assessment at ADMISSION, POST-OP, AND TRANSFER

### DVT/ PE RISK LEVEL & PROPHYLAXIS ORDERS

<table>
<thead>
<tr>
<th>Low Risk</th>
<th>Moderate Risk</th>
<th>Highest Risk</th>
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<tbody>
<tr>
<td>Observation patients, expected LOS &lt;48 hrs: Minor/ Ambulatory surgery or Age&lt; 50 and NO other risk factors, or Already on therapeutic anticoagulation</td>
<td>Most medical /surgical patients CHF, pneumonia, active inflammation, advanced age, dehydration, varicose veins, less than fully and independently ambulatory, many other factors. All patients not in the Low or Highest Risk Categories (see reverse for more risk factors)</td>
<td>Elective hip or knee arthroplasty Acute spinal cord injury with paresis Multiple major trauma Abdominal or pelvic surgery for cancer</td>
</tr>
</tbody>
</table>

#### Low Risk
- Early ambulation, education
- Education

#### Moderate Risk
- CHOOSE ONE PHARMACOLOGIC option
  - Enoxaparin 40 mg SC q 24 hrs
  - Enoxaparin 30 mg SC q 24 hrs (renal insufficiency dosing)
  - Heparin 5000 units SC q 8 hrs
  - Heparin 5000 units SC every 12hrs (if weight <50kg or age > 75) (Also (OPTIONAL) Sequential compression device)

#### Highest Risk
- CHOOSE ONE PHARMACOLOGIC option
  - Enoxaparin 40 mg SC q day
  - Enoxaparin 30 mg SC q 24 hrs (for renal insufficiency)
  - Heparin 5000 units SC q 8 hrs (End stage renal disease only)
  - Enoxaparin 30 mg SC q 12 hrs (knee replacement)
  - Fondaparinux 2.5 mg SC q day
  - Sequential compression device

### OR
The risk of adverse effects of pharmacologic prophylaxis outweighs the risk of DVT / PE Contraindication to pharmacologic prophylaxis (see reverse):
- Mechanical prophylaxis with sequential compression device OR
- Cannot be used (observe who are unable to perform ambulation, e.g., stroke, paralysis, severe pain, life-threatening condition, etc.)
# Complex VTE Order Set

## Deep Vein Thrombosis (DVT) Prophylaxis Orders
(For use in Elective General Surgery Patients)

### Thrombosis Risk Factor Assessment
(Choose all that apply)

<table>
<thead>
<tr>
<th>Each Risk Factor Represents 1 Point</th>
<th>Each Risk Factor Represents 2 Points</th>
<th>Each Risk Factor Represents 3 Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 41-60 years</td>
<td>Acute myocardial infarction</td>
<td>Age 75 years or older</td>
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<tr>
<td>Swollen legs (current)</td>
<td>Congestive heart failure (&lt;1 month)</td>
<td>History of DVT/PE</td>
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<tr>
<td>Varicose veins</td>
<td>Medical patient currently at bed rest</td>
<td>Positive Prothrombin 20210A</td>
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<td>Obesity (BMI &gt;25)</td>
<td>History of inflammatory bowel disease</td>
<td>Positive Lupus anticoagulant</td>
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<td>Minor surgery planned</td>
<td>History of prior major surgery (&lt;1 month)</td>
<td>Elevated serum homocysteine</td>
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<td>Sepsis (&lt;1 month)</td>
<td>Abnormal pulmonary function (COPD)</td>
<td>Heparin-induced thrombocytopenia (HIT)</td>
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<td>Serious Lung disease including pneumonia (&lt;1 month)</td>
<td>Subtotal:</td>
<td>(Do not use heparin or any low molecular weight heparin)</td>
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<tr>
<td>Oral contraceptives or hormone replacement therapy</td>
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<td>Elevated antithrombin antibodies</td>
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<td>Pregnancy or postpartum (&lt;1 month)</td>
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<td>Other congenital or acquired thrombophilia</td>
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<tr>
<td>History of unexplained stillborn infant, recurrent spontaneous abortion (≥3), premature birth with toxemia or growth-restricted infant</td>
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<td>Subtotal:</td>
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<tr>
<td>Other risk factors</td>
<td>Subtotal:</td>
<td>TOTAL RISK FACTOR SCORE:</td>
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</table>

## Related Links
Sample Protocol

### VTE Prophylaxis Protocol - PILOT

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Action</th>
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<tbody>
<tr>
<td>Start</td>
<td>Start time</td>
<td>Heparin 5000 units SQ Q 8 hours</td>
<td>Start</td>
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<td>Heparin 5000 units SQ Q 8 hours</td>
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<td>End</td>
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<td>Heparin 5000 units SQ Q 8 hours</td>
<td>End</td>
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<td>Heparin 5000 units SQ Q 8 hours</td>
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<td>Risk assessment (check one):</td>
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<td>Low - Patient is ambulating as much as he/she would at home and has no other VTE risk factors (see above)</td>
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<td>Moderate/High - All patients not in low or very low risk categories</td>
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<td>Very high post-op from high risk surgery (e.g., hip or knee arthroplasty), hip fracture, trauma or acute spinal cord injury</td>
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<td>Choose one of the following:</td>
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<td>Heparin SQ Q 6 hours X 3 days (do not use if actual body weight &lt; 50 kg or O2C &lt; 30 mmHg)</td>
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VTE Prophylaxis

Contraindications to pharmacologic prophylaxis? (See reverse)

- Y: Order mechanical prophylaxis & document "on-out" reason on protocol
- N: Re-evaluate risk daily

What is patient's risk for VTE: Low, Moderate/High or Very High? (See reverse)

Low

- Spinal/Epidural Anesthesia?
  - Y: UFH 5000 units SQ q8h or Enox 40mg SQ daily
  - N: BMI ≥ 40?
    - Y: CrCl ≤ 30ml/min?
      - Y: Underweight? (<50 kg)
        - N: Re-evaluate risk
          - N: Mechanical or no prophylaxis
        - Y: Call clinical pharmacy to discuss dosing options
      - N: CrCl ≤ 30ml/min?
        - Y: Fonda 2.5mg SQ daily (moderate/high/very high risk) or UFH 5000 units SQ q8h (moderate/high risk) or Enox 0.5 mg/kg SQ BID (very high risk) or Enox 0.5 mg/kg SQ DAILY (moderate/high risk) (Consider checking HEPXA or Fonda)
        - N: UFH 5000 units SQ q8h or Call clinical pharmacy to discuss dosing options

Moderate/High or Very High

- Are you sure there are no VTE risk factors? (See reverse)
  - Y: Re-evaluate risk
  - N: Mechanical or no prophylaxis

BMI ≥ 40?

- Y: CrCl ≤ 30ml/min?
  - Y: Underweight? (<50 kg)
    - N: Re-evaluate risk
      - N: Mechanical or no prophylaxis
    - Y: Call clinical pharmacy to discuss dosing options
  - N: CrCl ≤ 30ml/min?
    - Y: Fonda 2.5mg SQ daily (moderate/high/very high risk) or UFH 5000 units SQ q8h (moderate/high risk) or Enox 0.5 mg/kg SQ BID (very high risk) or Enox 0.5 mg/kg SQ DAILY (moderate/high risk) (No HEPXA or Fonda levels needed)
    - N: UFH 5000 units SQ q8h or Call clinical pharmacy to discuss dosing options

Anticoagulant Pharmacist
284-6379
7 days/week 0800-1600

*UFH= unfractionated heparin

Potential Contraindication to VTE Prophylaxis (INCLUDING BUT NOT LIMITED TO)

<table>
<thead>
<tr>
<th>Absolute</th>
<th>Relative</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active hemorrhage</td>
<td>ICH in last 12 mos.</td>
<td>Immune-mediated HIT</td>
</tr>
<tr>
<td>Recent acute major trauma</td>
<td>Craniootomy in last 2 weeks</td>
<td>Recent arteriotomy</td>
</tr>
<tr>
<td>Spine or intracranial surgery in last 72 hrs</td>
<td>Intra-ocular surgery in last 2 weeks</td>
<td>Anticipated admission &lt;48 hrs</td>
</tr>
<tr>
<td>Thrombolytics w/in last 24 hrs</td>
<td>G/GU bleed in last 30 days</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PLT &lt;50K or coagulopathy</td>
<td></td>
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<tr>
<td></td>
<td>End-stage liver disease</td>
<td></td>
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<tr>
<td></td>
<td>Active intracranial neoplasm</td>
<td></td>
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<tr>
<td></td>
<td>Hypertensive emergency</td>
<td></td>
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<tr>
<td></td>
<td>Post-op bleeding concerns</td>
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</tr>
</tbody>
</table>

The risk vs benefit of VTE prophylaxis must be considered in each patient. Contraindications must be interpreted with caution and analyzed on a case-by-case basis. For example, if a patient has minor bleeding, but their risk of VTE is exponentially greater, it may be advisable to implement pharmacologic VTE prophylaxis with UFH which has a short half-life and is reversible. Conversely, if a patient's bleeding risk is deemed to be greater than clotting risk, mechanical methods may be a better option. Call anticoagulation pharmacist to discuss if you have questions or are unsure (284-6379).

Potential risk factors for VTE (INCLUDING BUT NOT LIMITED TO)

- Acute medical illness
- Age > 50 yrs
- Anesthesia
- Central venous catheter
- Dehydration
- Diabetes
- Erythropoiesis-stimulating agents
- Estrogen-based contraceptives
- Heart failure
- History of VTE (family or patient)
- Hormone replacement
- Hypertension
- Immobility
- Inflammatory bowel disease
- Lung disease (acute or chronic)
- Malignancy

Risk Level

- Low: (<10% of our patients) ambulating as much as they would at home and have none of the VTE risk factors listed above
- Moderate/high: (most of our patients) all patients not at low or very high risk
- Very high risk: hip/knee arthroplasty, hip fracture, trauma, spinal cord injury

Other resources:
1) Call your area PCAP
2) anticoagulant_dosing_guideline on pharmacy webpage
https://hospital.health.unm.edu/intranet/pharmacy/documents/anticoagulantdosingguideline
UFH Protocol Example

<table>
<thead>
<tr>
<th>Anti-Xa level</th>
<th>Response</th>
<th>Next level</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00 – 0.09</td>
<td>Bolus 25 units/kg; increase infusion by 3 units/kg/hr</td>
<td>6 hours</td>
</tr>
<tr>
<td>0.10 – 0.19</td>
<td>Increase infusion by 2 units/kg/hour</td>
<td>6 hours</td>
</tr>
<tr>
<td>0.20 – 0.29</td>
<td>Increase infusion by 1 units/kg/hour</td>
<td>6 hours</td>
</tr>
<tr>
<td>0.30 – 0.69</td>
<td>NO CHANGE</td>
<td>Next am</td>
</tr>
<tr>
<td>0.70 – 0.79</td>
<td>Decrease infusion by 1 units/kg/hour</td>
<td>6 hours</td>
</tr>
<tr>
<td>0.80 – 0.89</td>
<td>STOP INFUSION for 1 hr, then decrease by 2 units/kg/hr</td>
<td>6 hours after restart</td>
</tr>
<tr>
<td>0.90 – 0.99</td>
<td>STOP INFUSION for 1 hr, then decrease by 3 units/kg/hr</td>
<td>6 hours after restart</td>
</tr>
<tr>
<td>1.00 – 1.09</td>
<td>STOP INFUSION for 2 hr, then decrease by 4 units/kg/hr</td>
<td>6 hours after restart</td>
</tr>
<tr>
<td>&gt; 1.10</td>
<td>STOP INFUSION for 2 hr, then decrease by 5 units/kg/hr and notify MD</td>
<td>6 hours after restart</td>
</tr>
</tbody>
</table>
Engage the Patient and Family

- AHRQ resources are free of charge for the first 500 copies
- Resource is in both English and Spanish
- “Staying Active and Healthy with Blood Thinners” DVD is also available

http://www.ahrq.gov/consumer/bloodclots.htm
Action Steps – Review

• Assess current practice
• Adopt a risk assessment
• Lay-out options for prophylaxis
• Standardize the process
• Provide decision support
• Assess use of protocol frequently
• Involve the patient and family
Optional Process and Outcome Measures

• The percent of patients who are assessed upon admission
• The percent of patients who receive screening upon transfer
• The percent of patients who develop VTE and are not on prophylaxis
• Incidence of hospital-acquired VTE (number of VTE per 100 admissions); goal: reduce by 50% in one year
• Incidence of hospital-acquired VTE resulting in fatality (number of deaths due to acquired VTE per 100 admissions)
• Compliance with appropriate VTE prophylaxis (percent of patients who should have received prophylaxis, whether screened or not, who actually received appropriate prophylaxis)
Key Resources

- Executive Summary: Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines *Chest* February 2012 141:2_suppl 7S-47S
- Qaseem et al, Venous Thromboembolism Prophylaxis in Hospitalized Patients: A Clinical Practice Guideline From the American College of Physicians Annals Internal Medicine 1 November 2011 155 (9):625-633
- American Congress of Obstetrics and Gynecology (ACOG)
Reference


References

Questions, Comments?
Contact Information

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vagramonte@ipro.org