VTE Standardized Risk Assessments and Assessment Driven Orders: Why and How

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Objectives

• Describe the Preventable Harm from VTE
• Describe the Role of Standard Risk Assessments
• Discuss how simple methods link Risk Assessments to *Ordering* VTE Prophylaxis
• Discuss the Process for *Implementing* VTE Prophylaxis
• DEVELOP AND APPLY STANDARD WORK SO THE AIM IS REACHED!!
Aim

- All Inpatients will Receive VTE Prophylaxis *Ordered & Implemented* (or a documented Reason for None) within 24 Hours of Admission
- BTW: There is no occasion for ‘None’
  - *At a minimum Early Ambulation via a protocol*
NOT Objectives

• Dig deeply into all the disagreements between the specialty societies
  – But you will learn how to navigate that maze
• Dig deeply into the newer anticoagulants
  – This isn’t a pharmacology talk!
  – It’s a process improvement one!
Why Talk about VTE Prophylaxis?

• 350,000 to 650,000 pts diagnosed with VTE per year
  – About ½ of those patients discharged with a VTE dx ACQUIRED the VTE in the hospital!

• Annual Deaths from VTE may be greater than annual deaths from Breast CA, HIV, and traffic accidents combined

• PE accounts for 10% of all hospital deaths and is listed by AHRQ as the #1 cause of hospital acquired death
Adherence to Prophylaxis Guidelines

- Premier database: 429 hospitals; 2005-2006
- Age > 40 LOS > 6 days and no contraindications
- Appropriate prophylaxis: type, dose, frequency, duration (7th ACCP)

<table>
<thead>
<tr>
<th>Prophylaxis</th>
<th>Medical (N=201,224)</th>
<th>Surgical (N=188,800)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any (&gt;1 dose)</td>
<td>66%</td>
<td>78%</td>
</tr>
<tr>
<td>Appropriate</td>
<td>13%</td>
<td>16%</td>
</tr>
</tbody>
</table>

Amin, J Hosp Med, 2009;4:E15
ENDORSE Results

- 70,000 patients in 358 hospitals, appropriate prophylaxis was administered in
  - 58.5% of surgical patients
  - 39.5% of medical patients

Why is VTE prophylaxis Underused?
Why Don’t We Do Better?

- Competing priorities
- Lack of awareness
- Battling guidelines
- Underestimation of clot risk
- Overestimation of bleeding risk
- *Under appreciation of the mortality of clot vs the morbidity of bleeding*
- *Culture that errors of commission are more egregious than errors of omission*
Why Don’t We Do Better?

- Lack of validated and practical risk assessment models
- Measurement issues
- Difficulty in translation of complicated and conflicted guidelines into everyday practice
- Failure to use a good QI/change management framework
What Do All Agree on?

• In patients at risk you must do some form of prophylaxis
In order to be sure to find all of those patients who we agree need prophylaxis, a standard risk assessment must be done on every patient to identify a patient’s risk of VTE and risk of hemorrhage:

- On admission
- On transfer
- After change in status
- On discharge
• Certain patients are always high risk for VTE:
  – Major orthopedic surgery (TJR, fx hips)
  – Spinal surgery
  – Major cancer surgery
What Don’t All Agree on?

• Risk for general medical patients
• Risk for other surgery patients
• Which prophylaxis to use
How risky are medical patients?

• But for many hospitalized patients, the risk of symptomatic VTE may be quite low – (< 1% ?)

• Debate amongst studies and across time

• Newer ACCP evidence more rigorous, some argue biased towards less intervention (more on this later!)
Challenge #1: Who

• How do we identify those patients whose risk for VTE is high enough to warrant primary VTE prevention measures?

• For which patients might mechanical methods of prophylaxis be sufficient?

• In which patients can the cost and risk of pharmacologic prophylaxis can be justified?
Risk Factors for VTE

Stasis
- Age > 40
- Immobility
- CHF
- Stroke
- Paralysis
- Spinal Cord injury
- Hyperviscosity
- Polycythemia
- Severe COPD
- Anesthesia
- Obesity
- Varicose Veins

Hypercoagulability
- Cancer
- High estrogen states
- Inflammatory Bowel
- Nephrotic Syndrome
- Sepsis
- Smoking
- Pregnancy
- Thrombophilia

Endothelial Damage
- Surgery
- Prior VTE
- Central lines
- Trauma

Risk of VTE in Medical Patients

- Most patients (> 90%) have at least moderate risk (≥ 3 risk factors)
- Severity of illness and/or underlying comorbidities (sepsis, low EF, severe COPD, cancer) compound risk
- Prophylaxis rates can improve
- The relative risks of VTE and bleeding (especially after a procedure) may change with longer hospitalization
- Risk assessments should occur regularly and at care transitions to ensure timely initiation of pharmacologic prophylaxis

### Relative Risk of VTE in Cancer

<table>
<thead>
<tr>
<th>Clinical Context</th>
<th>Relative Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy, age 60-70</td>
<td>1.0</td>
</tr>
<tr>
<td>Healthy, age 71-80</td>
<td>2.0</td>
</tr>
<tr>
<td>Breast Cancer</td>
<td>4.0</td>
</tr>
<tr>
<td>Breast Cancer with chemo</td>
<td>140</td>
</tr>
<tr>
<td>Lung Cancer</td>
<td>90</td>
</tr>
<tr>
<td>Pancreatic Cancer with chemo</td>
<td>150</td>
</tr>
<tr>
<td>GI Cancer with chemo</td>
<td>150</td>
</tr>
</tbody>
</table>

Source: Winoker S, Deitcher S. NOCR proceedings, January 2000
## VTE Levels of Risk

<table>
<thead>
<tr>
<th>Levels of Risk</th>
<th>DVT Risk Without Prophylaxis</th>
<th>Suggested Options</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low risk</strong></td>
<td></td>
<td>• No specific thromboprophylaxis</td>
</tr>
<tr>
<td>• Mobile minor surgery patients</td>
<td></td>
<td>• Early and “aggressive” ambulation</td>
</tr>
<tr>
<td>• Fully mobile medical patients</td>
<td>&lt;10 %</td>
<td></td>
</tr>
<tr>
<td><strong>Moderate risk</strong></td>
<td></td>
<td>• LMWH, UFH tid &gt; bid, or fondaparinux</td>
</tr>
<tr>
<td>• Most general, open gynecologic or urologic surgery</td>
<td>10-40%</td>
<td></td>
</tr>
<tr>
<td>• CHF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• COPD, pneumonia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Medically Ill</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>High risk</strong></td>
<td></td>
<td>• LMWH, fondaparinux, VKA (INR 2-3)</td>
</tr>
<tr>
<td>• Hip or knee arthroplasty, HFS</td>
<td>40-80%</td>
<td>• Mechanical prophylaxis may be used if risk of bleeding is high; switch to anticoagulants when risk decreases</td>
</tr>
<tr>
<td>• Major trauma, SCI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Abdominal/pelvic cancer surgery</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Medical prophylaxis

2012 ACCP
2.3. For acutely ill hospitalized medical patients at increased risk of thrombosis, we recommend anticoagulant thromboprophylaxis with LMWH, UFH or fondaparinux (Grade 1B)

2.4. For acutely ill hospitalized medical patients at low risk of thrombosis, we recommend against the use of pharmacologic prophylaxis or mechanical prophylaxis (Grade 1B)
So We Know Patients are at Risk.....

• What is the evidence that prophylaxis works?

• Which methods for which patients?
# Evidence: Medical Prophylaxis

<table>
<thead>
<tr>
<th>Trial</th>
<th>Endpoint</th>
<th>Relative Risk Reduction</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MEDENOX</strong>¹</td>
<td>Distal and proximal venographic DVT + symptomatic VTE + fatal PE</td>
<td>63%</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Enoxaparin 40 mg SC daily vs placebo</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PREVENT</strong>²</td>
<td>Compression ultrasonographic proximal DVT + symptomatic VTE + fatal PE</td>
<td>45%</td>
<td>0.002</td>
</tr>
<tr>
<td>Dalteparin 5,000 units SC daily vs placebo</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ARTEMIS</strong>³</td>
<td>Distal and proximal venographic DVT + symptomatic VTE + fatal PE</td>
<td>47%</td>
<td>0.03</td>
</tr>
<tr>
<td>Fondaparinux 2.5 mg SC daily vs placebo</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

VTE Prophylaxis Meta-Analysis

- 9 studies
- 19,958 medical patients
- Anticoagulant prophylaxis vs no treatment
- Results
  - 57% reduction in RR for symptomatic PE
  - 62% reduction in RR for fatal PE
  - 53% reduction in DVT
  - No significant increase in major bleeding

VTE Prophylaxis in Medical Patients Is Cost Effective

- $1,264 per patient for LMWH
- $2,245 for no prophylaxis

Pharmacologic Prophylaxis in Colorectal Surgery

<table>
<thead>
<tr>
<th>Study</th>
<th>LDH or LMWH</th>
<th>No treat/placebo</th>
<th>Peto OR 95% CI</th>
<th>Weight %</th>
<th>Peto OR 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lahnborg 1974 (22)</td>
<td>2/11</td>
<td>3/8</td>
<td></td>
<td>6.08</td>
<td>0.39 [0.05, 2.91]</td>
</tr>
<tr>
<td>Covey 1975 (18)</td>
<td>3/9</td>
<td>1/11</td>
<td></td>
<td>5.35</td>
<td>4.22 [0.49, 36.09]</td>
</tr>
<tr>
<td>Rem 1975 (24)</td>
<td>4/19</td>
<td>7/12</td>
<td></td>
<td>11.16</td>
<td>0.21 [0.05, 0.91]</td>
</tr>
<tr>
<td>Gallus 1976 (19)</td>
<td>5/44</td>
<td>13/46</td>
<td></td>
<td>23.35</td>
<td>0.35 [0.13, 0.98]</td>
</tr>
<tr>
<td>Joffe 1976 (20)</td>
<td>2/8</td>
<td>3/6</td>
<td></td>
<td>5.44</td>
<td>0.36 [0.04, 3.06]</td>
</tr>
<tr>
<td>Torngren 1978 (25)</td>
<td>7/41</td>
<td>11/34</td>
<td></td>
<td>22.05</td>
<td>0.44 [0.15, 1.26]</td>
</tr>
<tr>
<td>Negus 1980 (23)</td>
<td>0/14</td>
<td>6/19</td>
<td></td>
<td>7.93</td>
<td>0.13 [0.02, 0.74]</td>
</tr>
<tr>
<td>Valie 1988 (26)</td>
<td>0/6</td>
<td>1/5</td>
<td></td>
<td>1.59</td>
<td>0.11 [0.00, 5.68]</td>
</tr>
<tr>
<td>Maresil 1993 (14)</td>
<td>1/17</td>
<td>6/18</td>
<td></td>
<td>9.24</td>
<td>0.19 [0.04, 0.97]</td>
</tr>
<tr>
<td>Kosir 1996 (21)</td>
<td>0/3</td>
<td>0/7</td>
<td></td>
<td></td>
<td>Not estimable</td>
</tr>
<tr>
<td>Ho 1999 (15)</td>
<td>0/134</td>
<td>5/169</td>
<td></td>
<td>7.81</td>
<td>0.16 [0.03, 0.96]</td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>306</td>
<td>335</td>
<td>100.00</td>
<td>0.32</td>
<td>0.20 [0.00, 0.53]</td>
</tr>
</tbody>
</table>

Total events: 24 (LDH or LMWH), 56 (No treat/placebo)
Test for heterogeneity: Chi² = 8.58, df = 9 (P = 0.48), I² = 0%
Test for overall effect: Z = 4.47 (P < 0.00001)

- Heparin is superior to placebo
- UFH and LMWH are equally effective

Pharmacologic and Mechanical Prophylaxis in Colorectal Surgery

<table>
<thead>
<tr>
<th>Study or sub-category</th>
<th>LDH n/N</th>
<th>LDH+TED stockings n/N</th>
<th>Peto OR 95% CI</th>
<th>Weight %</th>
<th>Peto OR 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wille-J.1988 (17)</td>
<td>7/36</td>
<td>2/42</td>
<td>64.72</td>
<td>4.14</td>
<td>[1.04, 16.52]</td>
</tr>
<tr>
<td>Wille-J.1991 (10)</td>
<td>4/16</td>
<td>1/17</td>
<td>35.28</td>
<td>4.23</td>
<td>[0.65, 27.58]</td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>52</td>
<td>59</td>
<td>100.00</td>
<td>4.17</td>
<td>[1.37, 12.70]</td>
</tr>
</tbody>
</table>

Total events: 11 (LDH), 3 (LDH+TED stockings)
Test for heterogeneity: $\chi^2 = 0.00, \text{df} = 1 (P = 0.99), I^2 = 0$
Test for overall effect: $Z = 2.51 (P = 0.01)$

- Pharmacologic plus mechanical prophylaxis is superior to LDH

Challenge #2: How Long?

- At least ten days for all major ortho patients
- Most studies focused on 10-14 day duration in med/surg population
- At least until discharge for virtually everyone
Extended Duration?
Best Evidence for ......

• Minimum 10 days and up to 35 days:
  – Major Ortho: HFS, TKR, THR

• Up to 28 days:
  – Abd/Pelvic surgery for CA
  – Abd/Pelvis surgery if prior hx of VTE
  – Major trauma going to rehab
Extended treatment evidence not convincing for:

- Medical patients
- Elderly patients with multiple risk factors

(EXCLAIM study)
Challenge #3: With What?

• Mechanical Methods
  – Sequential compression, foot pump, elastic compression

• Pharmacologic
  – Low Molecular Weight Heparin (LMWH)
  – Fondaparinux
  – Unfractionated heparin (UFH)
  – Warfarin (VKA)
  – ASA
  – New oral agents: dabigatran/rivaroxaban/apixaban
Mechanical Methods

• Advantages:
  – No increased bleeding risk
  – Studies in surgical patients indicate efficacy

• Limitations:
  – Less high quality evidence, especially in medical patients
  – Poor compliance (nurses and patients)
    • 82% ICU
    • 62% outside of ICU  (Piazza, 2009)
  – Local skin complications
Pharmacologic Methods

• Advantages:
  • numerous studies prove efficacy (compared to placebo)

• Limitations:
  • bleeding and other side effects;
  • cost;
  • most studies establishing efficacy of newer agents have focused on the prevention of asymptomatic DVT
Challenge #4: How Do We Do It?

- Once we identify the patients who should get prophylaxis and we decide which form of prophylaxis they should get, how do we implement this system-wide?
Big Picture Strategy

- Distill evidence into prophylaxis protocol
- Perform risk assessment on ALL patients
- Integrate protocol with risk assessment into all admit and transfer orders
- Monitor ongoing to assess effectiveness and need for protocol ‘tweak’
- Devise method to detect those without prophylaxis in real time and intervene using multiple methods
Framework for Effective Implementation - No Single Intervention Will Do It!

- Assimilate
  - General
  - Definition of Best Practice
  - Guidelines
  - Regulatory
  - Position Statements
  - Evidence-based Reviews
  - Other Guidance

- Define Local Best Practice Standards and Expectations
  - Policies
  - Protocols

- Summarize Translate

- Effective Implementation: Operationalize

- Multi-faceted Interventions
  - Education
  - Order sets
  - Checklists
  - Special Management Teams
  - Triggered consultation
  - Alerts
  - Audit and Feedback
  - Measure-vention
  - Redesign Work Flow
  - Care Pathways
<table>
<thead>
<tr>
<th>Level</th>
<th>Hierarchy of Reliability</th>
<th>Prophylaxis Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No protocol (&quot;Usual care&quot;)</td>
<td>40%</td>
</tr>
<tr>
<td>2</td>
<td>Passive Decision support</td>
<td>50%</td>
</tr>
<tr>
<td>3</td>
<td>Protocol well integrated into orders</td>
<td>65-85%</td>
</tr>
<tr>
<td>4</td>
<td>Integrated protocols with high reliability implementation</td>
<td>90%</td>
</tr>
<tr>
<td>5</td>
<td>The above with failure identification and mitigation</td>
<td>95+%</td>
</tr>
</tbody>
</table>

Maynard, UCSD
Percent of Randomly Sampled Inpatients with Adequate VTE Prophylaxis

N = 2,944  mean 82 audits / month

Maynard, UCSD
UCSD - Decrease in Patients with Preventable HA VTE

Level 5: Oversights identified and addressed in real time

95+%
Pitfalls

• Too complicated: point base models especially
• No real guidance: prompt ≠ protocol
• Linkage between risk level and prophylaxis choice separated in time and space
• Failure to revise old order sets
• Allowing too much mechanical prophylaxis
• Failure to test, pilot, monitor
**FAX TO PHARMACY**

**Step 1: Contraindications to anticoagulants:**
- Absolute: (check if applicable)
  - Active hemorrhage from wounds, drains, lesions
  - Unfractionated or Low Molecular Weight Heparin use in Heparin Induced Thrombocytopenia
  - Severe trauma to head, spinal cord, abdomen with spleen or liver laceration or hemorrhage in last 4 weeks
  - Spinal or epidural anesthesia planned or performed, discuss with an anesthesiologist
  - Warfarin use in pregnancy
- Relative: (check if applicable)
  - Cerebral hemorrhage at any time
  - GI, GU bleed, or stroke in last 6 months
  - Thrombocytopenia (<100,000)
  - Coagulopathy
  - Active intracranial lesions/neoplasms
  - Proliferative retinopathy
  - Vascular access sites inaccessible to haemostatic control
  - Low Molecular Weight Heparin dialysis patients or those with creatinine clearance <=30

**Contraindication(s) to pharmacological prophylaxis with anticoagulants?**
Yes: If yes explain and choose non-pharmacological method unless also contraindicated (Peripheral vascular disease or wounds)

**Step 2: Risk Factors Associated with Clinical Setting:**
- Choose one with the HIGHEST risk score for the patient

<table>
<thead>
<tr>
<th>Score 1 point</th>
<th>Score 2 points</th>
<th>Score 3 points</th>
<th>Score 4 points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor surgery</td>
<td>Major surgery (&gt;45 min)</td>
<td>Major surgery with - myocardial infarction - congestive heart failure - severe sepsis infection</td>
<td>Elective lower extremity amputation</td>
</tr>
<tr>
<td>Trauma</td>
<td>Laparoscopic surgery (&gt;45 min)</td>
<td>Medical patient with additional risk factors (MI, CHF, Septis, Immobil)</td>
<td>Hip, pelvic or leg fracture</td>
</tr>
<tr>
<td>Observation</td>
<td>Bed rest &gt;12 hours</td>
<td>Stroke, history of (I)stroke</td>
<td>Stroke, history of (I)stroke</td>
</tr>
<tr>
<td>Central Venous Access</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**BASELINE RISK SCORE (IF SCORE = 5, GO TO STEP 4) → [ ]**

**Step 3: Risk Factors Associated with the Patient:**
(1 point each unless otherwise indicated)

<table>
<thead>
<tr>
<th>CLINICAL</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 41 to 60 years</td>
<td></td>
</tr>
<tr>
<td>Age over 60 years (2 points)</td>
<td></td>
</tr>
<tr>
<td>History of DVT/PE or current use</td>
<td></td>
</tr>
<tr>
<td>Pregnancy or postpartum (&lt;1 month)</td>
<td></td>
</tr>
<tr>
<td>Obesity (BMI &gt;30)</td>
<td></td>
</tr>
<tr>
<td>Varicose veins</td>
<td></td>
</tr>
<tr>
<td>Inflammatory bowel disease</td>
<td></td>
</tr>
<tr>
<td>Oral contraceptives or hormone replacement</td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL RISK POINTS → [ ]**

**Step 4: DVT/PE Prophylaxis Orders**

- Score of 1 or less
- Low Risk
- Early ambulation
- Sequential compression device

<table>
<thead>
<tr>
<th>Score of 2</th>
<th>Score of 3-4</th>
<th>Score of 5 or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate Risk</td>
<td>High Risk</td>
<td>Highest Risk</td>
</tr>
<tr>
<td>Sequential compression device</td>
<td>Sequential compression device and/or heparin 6000 units q 12 hrs</td>
<td>Sequential compression device and/or heparin 5000 units q 6 hrs subcut</td>
</tr>
<tr>
<td>Heparin 6000 units q 12 hrs subcut</td>
<td></td>
<td>Heparin 5000 units q 3 hrs subcut</td>
</tr>
<tr>
<td>Enoxaparin 40 mg subcut daily</td>
<td></td>
<td>Heparin daily with INR 2-3 (see warfarin orders) along with Heparin or Enoxaparin as above due to concerns for hypercoagulable states and Warfarin Alone</td>
</tr>
</tbody>
</table>

**TOTAL ADDITIONAL RISK POINTS → [ ]**

**PHYSICIAN SIGNATURE [ ]**

[Date/Time]
ONE HOSPITAL’S STORY
Tests

• Changed Ordering Process of VTE Prophylaxis
  – Soft Stop
  – Hard Stop
  – ED Verbal Order Checklist

• Real Time Intervention Tool
  – Quick and Easy Assessment
  – “Daisy’s Story” Included with Staff Education
Order Set
with VTE Hard Stop

<table>
<thead>
<tr>
<th>Order</th>
<th>VTE Risk Score</th>
<th>No VTE Reason</th>
<th>No VTE Reason</th>
<th>Instructions</th>
<th>Stop/Halt</th>
<th>CK Initiate</th>
<th>CK Web Address</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thromboprophylaxis Info

http://cliniqguide.cvid.com/gateway/resources=clonguidedocid=10479_64_17057

VTE Prophylaxis

<table>
<thead>
<tr>
<th>Order</th>
<th>Calculated Dose</th>
<th>UCM</th>
<th>Start Time</th>
<th>Schedule</th>
<th>Indications</th>
<th>Heparin Indications</th>
<th>Route</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Mechanical Prophylaxis

<table>
<thead>
<tr>
<th>Sequential Compression Device/AV Foot:</th>
</tr>
</thead>
</table>

Medical Prophylaxis (SELECT ONE) - 7 Item(s)

<table>
<thead>
<tr>
<th>Item(s)</th>
<th>Description</th>
<th>Dose</th>
<th>Route</th>
<th>Frequency</th>
<th>Indications</th>
<th>Heparin Indications</th>
<th>Route</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Warfarin (SELECT ALL) - 5 Items

<table>
<thead>
<tr>
<th>Item(s)</th>
<th>Description</th>
<th>Dose</th>
<th>Route</th>
<th>Frequency</th>
<th>Indications</th>
<th>Heparin Indications</th>
<th>Route</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE: Identifies a patient receiving current or...
Process Measure Improvement

% Patients with VTE Prophylaxis
*Ordered & Implemented*

- Corporate Hard Stop
- SSEM Pilots VTE Yellow Box Tool
- SSEM Pilots Soft Stop
- Corporate Soft Stop

![Graph showing percentage of patients with VTE prophylaxis from Jan-11 to Jul-12 for DPH, OLM, and SSEM.](chart.png)
LESSONS LEARNED

• **Hard Stops Work for MDs = Order Compliance @ >90%**
  – VTE Prophylaxis Ordered Timely -- Not Necessarily “Appropriate” Prophylaxis

• **Engage Bedside Caregivers**
  – Make it Easy to do the Right Thing
  – Simple better than Perfect
  – And about those SCD’s???

• **Inconsistent VTE Risk Assessments & Dysfunctional Workflow**
  – Risk Assessment Performed by Nurse using Complex Tool
  – Patients Significantly Underscored
  – Nurse Completes Risk Assessment *After* MD Orders Prophylaxis

• **Build Culture & Engage Leadership**
  – Building Culture & Increasing Awareness are Key Components to Success
  – Education Needed re: Risks and Incidence of PE/DVT of Hospitalized Patients
  – Patient Stories & Engagement Break Through Provider Complacency
Initial VTE Risk Assessment

**RN Feedback:**
Too Complicated & Time Consuming to Complete Appropriately

**Caprini Risk Assessment in EMR:**
Will generate a VTE Risk Score even if only partially completed.
Initial Workflow

Current Workflow:
RN Completes AFTER MD orders VTE Prophylaxis

VTE Risk and Suggested Prophylaxis For Surgical Patients

<table>
<thead>
<tr>
<th>Total Risk Factor Score</th>
<th>Incidence of DVT</th>
<th>Risk Level</th>
<th>Prophylaxis Regimen</th>
<th>Legend</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>&lt;10%</td>
<td>Low Risk</td>
<td>No specific measures; early ambulation</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>10-20%</td>
<td>Moderate Risk</td>
<td>ES, IPC, LDH (5000 U), or LMWH (&lt;3400 U)</td>
<td></td>
</tr>
<tr>
<td>3.4</td>
<td>20-40%</td>
<td>High Risk</td>
<td>IPC, LDH (5000 U), or LMWH (&lt;3400 U)</td>
<td></td>
</tr>
<tr>
<td>5 or more</td>
<td>40-80%</td>
<td>Highest Risk</td>
<td>Pharmacological: LDH, LMWH (&lt;3400 U), Warfarin, or FXa* alone or in combination with ES or IPC</td>
<td></td>
</tr>
</tbody>
</table>

*Use for major orthopedic surgery: Check box if answer is “YES”

Prophylaxis Safety Considerations:
- Is patient experiencing any active bleeding?
- Does patient have (or has had history) of heparin-induced thrombocytopenia?
- Does patient’s platelet count <100,000/mmm²?
- Is patient taking oral anticoagulants, platelet inhibitors (e.g., NSAIDS, Clopidogrel, Salicylates)?
- Is patient’s creatinine clearance abnormal? If yes, please indicate value

If any of the above boxes are checked, patient may not be a candidate for anticoagulant therapy and you should consider alternative prophylactic measures: elastic stockings and or IPC

Anticoagulants: Factors Associated with Increased Bleeding
- Does patient have severe prostatic arterial disease?
- Does patient have congestive heart failure?
- Does patient have an acute superficial/deep vein thrombosis?

If any of the above boxes are checked, then patient may not be a candidate for intermittent compression therapy and you should consider alternative prophylactic measures.

Engaging Senior Leadership

SHOW ME THE DATA.....

- Incidence of HA PE/DVT
- Mortality Rates
- Readmission Rates
- Length of Stay
Initiatives In Progress

• Order Set Decision Support Guides MD toward **Appropriate** VTE Prophylaxis (3 Bucket Model)
  – **Simplified** Tool Performed by MD on Admission, Transfer & Peri-Op
  – MD Risk Assessment linked to Appropriate Prophylaxis Order
  – Order Set Design Directs Physician toward Pharmacological Options unless Contraindicated
  – Decrease Variation in Process
# 3 Bucket Model

## Complete Assessment at ADMISSION, POST-OP, AND TRANSFER

### DVT/PE RISK LEVEL & PROPHYLAXIS ORDERS

<table>
<thead>
<tr>
<th>Bucket</th>
<th>Low Risk</th>
<th>Moderate Risk</th>
<th>Highest Risk</th>
</tr>
</thead>
</table>
| □ Low Risk | Observation patients, expected LOS <48 hrs: Minor/Ambulatory surgery or Age < 50 and NO other risk factors, or Already on therapeutic anticoagulation | CHOOSE ONE PHARMACOLOGIC option | Elective hip or knee arthroplasty  
Acute spinal cord injury with paraplegia  
Multiple major trauma  
Abdominal or pelvic surgery for cancer |
| □ Moderate Risk | □ 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 12 hrs (if weight < 50kg or age > 75)  
Also (OPTIONAL) □ Sequential compression device | □ 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  
AND □ Sequential compression device | □ Mechanical prophylaxis with sequential compression device OR  
□ Contraindicated (peripheral vascular disease or wounds) |

The risk of adverse effects of pharmacologic prophylaxis outweighs the risk of DVT / PE. Contraindication to pharmacologic prophylaxis (see reverse):
Advice for Others

• Steal Shamelessly
• Engage Senior Leadership
• Multi-Disciplinary Team – Frequent Check-Ins
• Valid but Simple Risk Assessment Tool
• MD Completes Risk Assessment & Order At Same Time
• Learn Workflow & Workarounds
• Patient Stories Engage Staff & Increase Ownership
Advice for Others

- Small tests of change........
- Rapid cycle PDSA
- Involve the front line in design
- Implement
- Spread

• BEWARE THE MANDATE FROM ON HIGH
Kim & Steve’s Top Ten Evidence Based Interventions

10. Find the stories of patients who have fallen through the cracks and ended up with a hospital-acquired VTE
9. Give nurses and doctors the same risk assessment tools and use hard stops in the CPOE process.
8. Use pharmacists as key real time ‘decision support’ for protocols and when patients have contraindications
7. Use protocols for dosing and monitoring when using unfractionated heparin
6. Make prophylaxis ordering an “opt out” instead of an “opt in” process
Kim & Steve’s Top Ten Evidence Based Interventions

5. If assessments are not being done reliably, try changing roles

4. Assess every patient upon admission of his/her risk for VTE using the VTE risk assessment screening tool (instead of just for certain diagnoses or procedures)

3. Develop standard written order sets which link the risk assessment to the choice of prophylaxis

2. Adopt a VTE risk assessment screening tool, such as the 3 bucket tool from UCSD
1. Adopt a SIMPLE standardized risk-linked menu of choices for prophylaxis

What is a Pomelo?

- A pomelo is the largest citrus fruit. The rind is very thick but soft and easy to peel away. The resulting fruit has a light yellow to coral pink flesh and can vary from juicy to slightly dry and from seductively spicy-sweet to tangy and tart.

- A pomelo is basically a supersized grapefruit with a very thick and soft rind.

Accuracy vs. Accessibility
Complete Assessment at ADMISSION, POST-OP, AND TRANSFER

<table>
<thead>
<tr>
<th>DVT/PE RISK LEVEL &amp; PROPHYLAXIS ORDERS</th>
<th>LOW RISK</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Low Risk</td>
<td>□ Early ambulation, education</td>
</tr>
<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>□ Education</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MODERATE RISK</th>
<th>CHOOSING ONE PHARMACOLOGIC option</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Moderate Risk</td>
<td>□ Enoxaparin 40 mg SC q 24 hrs</td>
</tr>
<tr>
<td>Most medical/surgical patients</td>
<td>□ Enoxaparin 30 mg SC q 24 hrs</td>
</tr>
<tr>
<td>CHF, pneumonia, active inflammation,</td>
<td>□ Heparin 5000 units SC q 8 hrs</td>
</tr>
<tr>
<td>advanced age, dehydration, varicose</td>
<td>□ Heparin 5000 units SC every 12 hrs (if weight &lt;50kg or age &gt;75)</td>
</tr>
<tr>
<td>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>Also (OPTIONAL)</td>
</tr>
<tr>
<td>□ Moderate Risk</td>
<td>□ Sequential compression device</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HIGHEST RISK</th>
<th>CHOOSING ONE PHARMACOLOGIC option</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Highest Risk</td>
<td>□ Enoxaparin 40 mg SC q day</td>
</tr>
<tr>
<td>Elective hip or knee arthroplasty</td>
<td>□ Enoxaparin 30 mg SC q 24 hrs</td>
</tr>
<tr>
<td>Acute spinal cord injury with paralysis</td>
<td>□ Heparin 5000 units SC q 8 hrs</td>
</tr>
<tr>
<td>Multiple major trauma</td>
<td>□ Heparin 30 mg SC q 12 hrs (knee replacement)</td>
</tr>
<tr>
<td>Abdominal or pelvic surgery for cancer</td>
<td>□ Fondaparinux 2.5 mg SC q day</td>
</tr>
<tr>
<td>□ Highest Risk</td>
<td>AND</td>
</tr>
<tr>
<td>□ Sequential compression device</td>
<td></td>
</tr>
</tbody>
</table>

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
□ Contraindicated (peripheral vascular disease or wounds)
VTE Change Package

- One page Overview
- Driver Diagrams
- Narrative with references

Questions

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