VTE Prevention and Treatment in Overall Quality of Inpatient Care

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Clot Formation and Embolization
VTE Presentations and Consequences

- acute deep venous thrombosis (DVT)
  - Most common ED presentation

- pulmonary embolism (PE)
  - Most feared complication of VTE
    - drives urgency of DVT treatment

- post-thrombotic syndrome (PTS)
  - Less of an acute consideration among providers
    - incidence increasing¹
    - incidence impacted by aggressiveness of early DVT therapy²

2. Kreidy R, ISRN Vasc Med 2011, Article ID 513603

Post-Phlebitic Syndrome
Venous Thromboembolism

Annual incidence of VTE in the US:

- Approximately 600,000 cases of VTE\textsuperscript{1,2}
- Estimated 180,000 deaths due to DVT/PE\textsuperscript{1}

Annual number at risk for VTE in US hospitals:

- 7.7 million medical service inpatients\textsuperscript{3}
- 4.3 million surgical service inpatients\textsuperscript{3}
- 2/3 of VTE cases and deaths are hospital-acquired\textsuperscript{1}

PE is the leading preventable cause of hospital death\textsuperscript{4}


VTE Epidemiology: Why More Cases?

- Consider the risk factors for VTE:
  - Increasing age\textsuperscript{1,2}
    - population is aging; fastest growing US demo is > 75
  - Obesity\textsuperscript{1}
    - incidence never higher
  - Cancer\textsuperscript{1,3}
    - more common, and patients live longer after diagnosis
  - Heart failure\textsuperscript{4}
    - better medical and device therapy prolongs (at-risk) life
  - Other chronic illnesses / debilities with longer life\textsuperscript{4}

VTE Epidemiology: More Attention

• Growing incidence means growing expense
  – Healthcare resources
    • inpatient v outpatient
    • inpatient length of stay
  – Lost productivity1

• Sutton’s law
  – Increasing focus on disease prevention
  – VTE prevention now a quality indicator, pay-for-performance criterion2


VTE Epidemiology: More Attention

• Surgeon General’s / NHLBI Workshop May 20061
  – Opened new funding opportunities

• NQF / TJC workshops 2006-081-4
  – Focused jointly on VTE, proper anticoagulant use

• Surgeon General’s report Sep 20085
  – “call to action,” “critical research priority”

Epidemiology of VTE in Acutely Ill Medical Patients in the US

- >8 million hospitalized acutely ill medical patients at risk for VTE
- Largest dx patient groups (~70% of at-risk hospitalized population):
  - Heart failure
  - Respiratory failure
  - Pneumonia
  - Cancer
- Prophylaxis rates across groups ranged from 15.3% to 49.2%
- 203,968 hospital-acquired VTE events/year, affecting 3 of every 100 medical patients
  - 161,669 symptomatic DVTs
  - 42,299 symptomatic PEs
  - 53,499 VTE-related deaths
- Improving prophylaxis from 28.8% to 95% will reduce the frequency of these events by ~40%


Risk of VTE in Hospitalized Medical Patients

- Patients hospitalized for acute medical illness have more than a 10-fold increased risk for VTE
- Nursing home residents are more than twice as likely as nonresidents to develop DVT/PE
- VTE prophylaxis remains underutilized or inadequate in hospitalized medical patients
  - Underuse often occurs because of unwarranted safety concerns

VTE in Hospitalized Patients

Not Just a Surgical Problem

- 50%-70% of symptomatic VTEs occur in nonsurgical patients
- 70%-80% of fatal PEs occur in nonsurgical patients
- DVT was detected by ultrasound in 33% of medical patients in the ICU during an 8-month screening study

Incidence of DVT in Medical and Surgical Patients

Correlation With the Number of Risk Factors

<table>
<thead>
<tr>
<th>Number of Risk Factors</th>
<th>Positive for DVT, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>1</td>
<td>24</td>
</tr>
<tr>
<td>2</td>
<td>36</td>
</tr>
<tr>
<td>3</td>
<td>50</td>
</tr>
<tr>
<td>&gt;3</td>
<td>100</td>
</tr>
</tbody>
</table>

Distribution of Patients With DVT by Age

Potential Mechanisms by Which Clinical Conditions Facilitate VTE

Increased baseline propensity for thrombosis

Hypercoagulability
Direct vessel injury
Blood stasis

Acute insult

Hypercoagulability
Direct vessel injury
Blood stasis

Risk Factors for VTE

- Surgery
- Trauma (major trauma or lower-extremity injury)
- Immobility, lower-extremity paresis
- Cancer (active or occult)
- Cancer therapy
- Venous compression
- Previous VTE
- Increasing age
- Pregnancy/postpartum period
- Estrogen-containing OCs or HRT
- Erythropoiesis-stimulating agents
- Acute medical illness
- Inflammatory bowel disease
- Nephrotic syndrome
- Myeloproliferative disorders
- Paroxysmal nocturnal hemoglobinuria
- Obesity
- Central venous catheterization
- Inherited or acquired thrombophilia

Independent Risk Factors for First Lifetime Definite VTE Within Olmsted County

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>AR*</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitalization or nursing home</td>
<td>58.8</td>
<td>53.4-64.2</td>
</tr>
<tr>
<td>Hospitalization with surgery</td>
<td>23.8</td>
<td>20.3-27.3</td>
</tr>
<tr>
<td>Hospitalization without surgery</td>
<td>21.5</td>
<td>17.3-25.6</td>
</tr>
<tr>
<td>Nursing home</td>
<td>13.3</td>
<td>9.9-16.8</td>
</tr>
<tr>
<td>Active malignant neoplasm</td>
<td>18.0</td>
<td>13.4-22.6</td>
</tr>
<tr>
<td>Trauma</td>
<td>12.0</td>
<td>9.0-14.9</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>9.5</td>
<td>3.3-15.8</td>
</tr>
<tr>
<td>Prior central venous catheter or pacemaker</td>
<td>9.1</td>
<td>5.7-12.6</td>
</tr>
<tr>
<td>Neurological disease with extremity paresis</td>
<td>6.9</td>
<td>3.5-10.2</td>
</tr>
<tr>
<td>Prior superficial vein thrombosis</td>
<td>5.4</td>
<td>3.0-7.7</td>
</tr>
</tbody>
</table>

AR=attributable risk
The Importance of DVT Prophylaxis in Congestive Heart Failure

LVEF = left ventricular ejection fraction.

The high prevalence of DVT in chronic obstructive pulmonary disease (COPD) patients with exacerbation warrants routine screening

- COPD patients with DVT are older, more likely to be inpatients, more likely to be in the ICU and mechanically ventilated, and more often had concomitant PE

- Up to 25% of hospitalized patients with respiratory conditions are estimated to have DVT

Outpatient and Inpatient VTE Are Linked

- 74% of VTEs present in outpatients
- 23% of outpatient VTE patients have had recent surgery; 37% recently hospitalized
- Only 43% had received VTE prophylaxis

Strategies for Prevention of VTE

- Pharmacologic
  - LMWH (eg, enoxaparin, dalteparin)
  - Low-dose UFH
  - Fondaparinux
  - Vitamin K antagonist (eg, warfarin)

- Mechanical
  - Intermittent pneumatic compression
  - Graduated elastic compression stockings

Fondaparinux is not approved by the FDA for VTE prophylaxis in medical patients.
Key ACCP 2012 Practice Guideline Recommendations

- Every hospital should develop a formal strategy that addresses the prevention of VTE (Grade 1A)
- Aspirin should not be used alone as thromboprophylaxis for any patient group (Grade 1A)
- Mechanical methods of thromboprophylaxis should be used primarily for patients at high bleeding risk (Grade 1A) or possibly as an adjunct to anticoagulant thromboprophylaxis (Grade 2A)

ACCP-Recommended Thromboprophylaxis in Hospital Patients According to Risk Level

<table>
<thead>
<tr>
<th>Level of Risk</th>
<th>Suggested Thromboprophylaxis Options</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low risk</strong></td>
<td></td>
</tr>
<tr>
<td>Minor surgery in mobile patients</td>
<td>No specific thromboprophylaxis</td>
</tr>
<tr>
<td>Medical patients who are fully mobile</td>
<td>Early and “aggressive” ambulation</td>
</tr>
<tr>
<td><strong>Moderate risk</strong></td>
<td></td>
</tr>
<tr>
<td>Most general, open gynecologic or urologic surgery patients</td>
<td>LMWH (at recommended doses), low-dose UFH bid or tid, fondaparinux</td>
</tr>
<tr>
<td>Medical patients, bed rest or sick</td>
<td>Mechanical thromboprophylaxis</td>
</tr>
<tr>
<td>Moderate VTE risk plus high bleeding risk</td>
<td></td>
</tr>
<tr>
<td><strong>High risk</strong></td>
<td></td>
</tr>
<tr>
<td>Hip or knee arthroplasty, hip fracture surgery</td>
<td>LMWH (at recommended doses), fondaparinux, oral vitamin K antagonist (INR 2-3)</td>
</tr>
<tr>
<td>Major trauma, spinal cord injury</td>
<td></td>
</tr>
<tr>
<td>High VTE risk plus high bleeding risk</td>
<td>Mechanical thromboprophylaxis</td>
</tr>
</tbody>
</table>
Key ACCP Practice Guideline Recommendations

- In patients admitted to the hospital with an acute medical illness, thromboprophylaxis with LMWH, low-dose UFH, or fondaparinux is recommended (Grade 1A)
- On admission to the ICU, all patients should be assessed for their risk of VTE, and most should receive thromboprophylaxis (Grade 1A)

The Importance of DVT Prophylaxis in Patients With Cancer

- VTE is a major complication of cancer, occurring in 4% to 20% of patients, and a leading cause of death in patients with cancer
- Hospitalized patients with cancer and cancer patients receiving active therapy are at greatest risk for VTE
  - Cancer increases risk 4.1-fold
  - Chemotherapy increases risk 6.5-fold
- According to 2007 ASCO guidelines:
  - All hospitalized cancer patients and patients with cancer undergoing surgery should be considered for prophylaxis
  - LMWH is the preferred drug

Concurrent VTE and Cancer Increases the Risk of Death


Probability of Death Within 183 Days of Initial Hospital Admission

Prophylaxis in Cancer Patients

- Cancer patients undergoing surgical procedures: routine thromboprophylaxis that is appropriate for the type of surgery (Grade 1A)
- Cancer patients who are bedridden with an acute medical illness: routine thromboprophylaxis as for other high-risk medical patients (Grade 1A)
- Cancer patients receiving chemotherapy or hormonal therapy: recommend against the routine use of thromboprophylaxis for the primary prevention of VTE (Grade 1C)
- Cancer patients overall: recommend against the routine use of primary thromboprophylaxis to try to improve survival (Grade 1B)
Recommendations for Prophylaxis in Medical Patients

ACCP 2012 and IUA 2006 Guidelines

In acutely ill medical patients who have been admitted to the hospital with 1,2

- Congestive heart failure or severe respiratory disease
- Or who are confined to bed and have ≥1 additional risk factors, including active cancer, previous VTE, sepsis, acute neurologic disease, or inflammatory bowel disease

- LMWH (Grade 1A; IUA: enoxaparin 40 mg qd or dalteparin 5000 qd)
- Low-dose UFH (Grade 1A; IUA: 5000 IU tid)
- Fondaparinux (Grade 1A)*

VTE Prophylaxis in Acutely Ill Medical Patients

Primary Efficacy End Points: Implications for Clinical Practice

<table>
<thead>
<tr>
<th>Trial</th>
<th>VTE</th>
<th>RRR</th>
<th># Needed to Treat</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEDENOX1</td>
<td>Distal and proximal venographic DVT + symptomatic VTE + fatal PE</td>
<td>63%</td>
<td>10</td>
</tr>
<tr>
<td>PREVENT2</td>
<td>Compression ultrasonographic DVT + symptomatic VTE + fatal PE</td>
<td>45%</td>
<td>45</td>
</tr>
<tr>
<td>ARTEMIS3</td>
<td>Distal and proximal venographic DVT + symptomatic VTE + fatal PE</td>
<td>47%</td>
<td>20</td>
</tr>
</tbody>
</table>

VTE Prophylaxis: 19,958 Medical Patients/9 Studies (Meta-analysis)

- 62% reduction in fatal PE
- 57% reduction in fatal or nonfatal PE
- 53% reduction in symptomatic DVT

<table>
<thead>
<tr>
<th>Study, Year</th>
<th>Prophylaxis, n/n</th>
<th>Placebo, n/n</th>
<th>RR (Fixed) (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Samama et al, 1999</td>
<td>1/291</td>
<td>2/288</td>
<td>0.49 (0.05 to 5.43)</td>
</tr>
<tr>
<td>Leizorovic et al, 2004</td>
<td>5/1759</td>
<td>11/1739</td>
<td>0.45 (0.16 to 1.29)</td>
</tr>
<tr>
<td>Lederle et al, 2006</td>
<td>4/140</td>
<td>8/140</td>
<td>0.50 (0.15 to 1.62)</td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td></td>
<td></td>
<td>0.47 (0.22 to 1.00)</td>
</tr>
<tr>
<td>Total events</td>
<td>10</td>
<td>21</td>
<td></td>
</tr>
</tbody>
</table>

General Surgery Recommendations

- Low-risk patients, minor procedure, no additional risk factors: recommend against specific thromboprophylaxis other than early and frequent ambulation (Grade 1A)
- Moderate-risk patients, major procedure for benign disease: LMWH, LDUH, or fondaparinux (Grade 1A)
- Higher-risk patients, major procedure for cancer: LMWH, LDUH 3 times/day, or fondaparinux (Grade 1A)
- Patients with multiple risk factors who are thought to be at high risk: LMWH, LDUH 3 times/day, or fondaparinux with GCS and/or IPC (Grade 1C)
General Surgery Recommendations

- Patients with high risk of bleeding: GCS or IPC (Grade 1A); pharmacologic therapy substituted or added to mechanical thromboprophylaxis once high bleeding risk decreases (Grade 1C)

- For patients undergoing major general surgery, continue thromboprophylaxis until discharge (Grade 1A)

- Selected high-risk patients, including some who have undergone major cancer surgery or have had VTE previously, continue thromboprophylaxis after discharge; consider LMWH for up to 28 days

Guidelines for VTE Prophylaxis in Orthopedic Patients

<table>
<thead>
<tr>
<th></th>
<th>ACCP¹</th>
<th>IUA²</th>
<th>AAOS³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total hip replacement</td>
<td>LMWH, fondaparinux, warfarin</td>
<td>LMWH, fondaparinux, warfarin, IPC or FIT</td>
<td>Aspirin, LMWH, fondaparinux, warfarin</td>
</tr>
<tr>
<td>Total knee replacement</td>
<td>LMWH, fondaparinux, warfarin</td>
<td>LMWH or warfarin</td>
<td>Aspirin, LMWH, fondaparinux, warfarin</td>
</tr>
<tr>
<td>Arthroscopic knee surgery</td>
<td>LMWH for higher-risk patients</td>
<td>LMWH or IPC if contraindications to LMWH</td>
<td>LMWH or IPC if contraindications to LMWH</td>
</tr>
<tr>
<td>Multiple trauma</td>
<td>LMWH or IPC</td>
<td>LMWH or IPC if contraindications to LMWH</td>
<td>LMWH or IPC if contraindications to LMWH</td>
</tr>
</tbody>
</table>

FIT = foot impulse technology; IPC = intermittent pneumatic compression.

Aspirin in Orthopedic Surgery: The Controversy

- ACCP\(^1\): Aspirin should not be used alone as thromboprophylaxis for any patient group (Grade 1A)
- AAOS\(^2\): Aspirin use is recommended in the following:
  - Patients at standard risk of both PE and major bleeding (Level III, Grade B)\(^a\)
  - Patients at standard risk of PE and at elevated (above standard) risk of major bleeding (Level III, Grade C)\(^b\)
  - Patients at elevated (above standard) risk of both PE and major bleeding (Level III, Grade C)\(^b\)

\(^a\) LMWH, synthetic pentasaccharides, and warfarin are also recommended.
\(^b\) Warfarin and none are also recommended.


VTE After Orthopedic Surgery

- VTE is common after major orthopedic surgery\(^1\)
- Without prophylaxis, approximately 60% of patients have evidence of DVT at hospital discharge\(^1\)
- Prevalence of asymptomatic DVT is greater than 2-fold higher after knee replacement than hip replacement 7 to 10 days after surgery\(^2\)
- In patients who receive short-duration LMWH, the prevalence of DVT is 16% after hip replacement and 31% after knee replacement\(^1\)
- Use of estrogen therapy increases the risk of VTE\(^3\)

Prevention of VTE After Major Orthopedic Surgery: Rivaroxaban vs Enoxaparin

Meta-analysis of 3 RECORD pivotal trials

![Graph showing the comparison between Rivaroxaban and Enoxaparin for Symptomatic VTE and Death, and Major Bleeding.](image)

- Symptomatic VTE and Death:
  - Rivaroxaban: 0.4% at 2 Weeks, 0.5% at End of Period
  - Enoxaparin: 0.8% at 2 Weeks, 0.2% at End of Period
  - *P* < 0.001

- Major Bleeding:
  - Rivaroxaban: 0.2% at 2 Weeks, 0.2% at End of Period
  - Enoxaparin: 0.3% at 2 Weeks, 0.2% at End of Period
  - *P* = NS


VTE Prevention After Hip Fracture Surgery

Incidence of VTE by Day 11

![Graph showing the comparison between Fondaparinux and Enoxaparin for VTE, Any DVT, Proximal DVT, and Distal DVT.](image)

- VTE:
  - Fondaparinux: 8.3%
  - Enoxaparin: 19.1%
  - *P* < 0.001

- Any DVT:
  - Fondaparinux: 7.9%
  - Enoxaparin: 18.8%
  - *P* < 0.001

- Proximal DVT:
  - Fondaparinux: 0.9%
  - Enoxaparin: 4.3%
  - *P* < 0.001

- Distal DVT:
  - Fondaparinux: 6.7%
  - Enoxaparin: 15%
  - *P* < 0.001

Neurosurgery Recommendations

- Routine use of prophylaxis in all patients undergoing major neurosurgery (Grade 1A)
  - Optimal use of IPC (Grade 1A)
  - Acceptable alternatives to IPC: post-op LMWH (Grade 2A) or LDUH (Grade 2B)
- In patients with particularly high thrombosis risk, combine mechanical and pharmacologic method (GCS and/or IPC; post-op LMWH or LDUH) (Grade 2B)

Trauma Recommendations

- All major trauma patients should receive prophylaxis (Grade 1A)
- Initiate LMWH as soon as possible in the absence of major contraindications (Grade 1A)
- Use GCS +/- IPC when LMWH prophylaxis is delayed or contraindicated (Grade 1B)
- Consider extended prophylaxis with LMWH or VKA in major immobility (Grade 2C)
Initiating Treatment of DVT in the ED

- approaches to DVT Treatment
  - anticoagulation
  - thrombolysis
  - thrombectomy
- treatment is associated with dramatic reduction in mortality from PE
- oral anticoagulation with warfarin must be preceded by heparin treatment

Kearon C, Chest 2012; 141(2)(Suppl):e419S–e494S

Contraindications to Anticoagulation

**Absolute**
- Intracranial hemorrhage
- Active internal bleeding
- Bleeding peptic ulcer
- Malignant hypertension

**Relative**
- Chronic liver disease
- Recent surgery
- Recent stroke
- Poorly controlled hypertension
- Brain metastases
- Alcoholism
- Fall risk

Kearon C, Chest 2012; 141(2)(Suppl):e419S–e494S
Typical Outpatient DVT Regimen

- enoxaparin 1mg/kg SQ OR fonda 7.5mg SQ in ED
- patient and family teaching (perhaps in observation unit)
- dispense enoxaparin or fondaparinux (5d supply) and warfarin (28x2.5mg tabs)
- enoxaparin 1mg/kg SQ BID or fondaparinux 7.5mg
- warfarin titrated dose 2.5-10 q PM

Pollack, unpublished

Changing the Paradigm--Outpatient

- New oral anticoagulants may offer VTE treatment without bridging to warfarin
- Could greatly facilitate VTE management by emergency physicians and hospitalists
- Rivaroxaban is now available in VTE treatment indication
Changing the Paradigm--Inpatient

- Important focus on outpatient treatment, but higher-risk patients and those with iliofemoral clots are usually admitted
- Usual ED course of action is to anticoagulate, admit
- For iliofemoral DVT, with higher risk of PE and longer DVT morbidity, referral for intervention (pharmacoinvasive vs surgical) should be considered

More Aggressive DVT Treatment

- In the ED, lytic therapy for VTE limited to massive PE
- Early endovascular lysis may be beneficial in iliofemoral DVT
  - “open vein” hypothesis → reduced incidence of PTS
  - Recognition of links between longer/higher thrombus burden and PTS and/or recurrent VTE has become clearer
  - Over time, therapeutic approaches to reach “open vein” have become more sophisticated
More Aggressive DVT Treatment

• Newest endovascular techniques utilize local mechanical thrombus fragmentation, with or without aspiration
  – By sequestering clot before “enhanced” CDT, risk of both bleeding and PE reduced

• AngioJet (Possis Medical)
• Trellis (Covidien)


TRELLIS-8 Infusion System

© 2009 Achille Bigiardi Photography (used by permission).
Who Might Benefit?

- Patient types identifiable in the ED who would be well-suited for referral for endovascular therapy
  - Older patients with terminal disease
    - PE might otherwise shorten remaining quality lifespan
  - Patients with contraindications to anticoagulation
    - may be preferable to IVC filter placement
  - Potentially higher risk of PTS
    - need to educate emergency physicians and hospitalists


Risk Factors for PTS Apparent at Time of DVT Diagnosis

- Previous ipsilateral DVT
- Extent of index DVT
- Proximal (vs distal) DVT
- High BMI
- Thrombophilia
- Older age, male gender are weak predictors

Institute for Healthcare Improvement

This measure is used to assess the percentage of hospitalized patients, 18 years and older, hospitalized for a medical condition or surgery at risk for venous thromboembolism (VTE) who have VTE education within 24 hours of admission that includes 1) VTE risk, 2) signs and symptoms, 3) early and frequent mobilization, and 4) clinically appropriate treatment/prophylaxis methods.
A 500 bed hospital can expect 250 hospital acquired DVT/PE per year. Half of these are preventable.

Going from 50 to 90% VTE prophylaxis over the course of a year will avoid 68 DVTs, 29 PEs, & 5 Deaths.

The Multidisciplinary Team: The Engine of Quality Improvement

- Backbone of quality improvement (QI) efforts
- Impact the interventions developed AND their implementation
- Synergistic
  - Productive capacity = more than the sum of all individual team members taken together
Different Types of Metrics in VTE Prevention Efforts

**Structure**
- Dedicated quality improvement team?
- Standardized order sets, protocols?
- Electronic Health Record? CPOE?

**Process**
- % with VTE risk assessment documented
- % with prophylaxis or contraindication within 24 hrs
- % using standardized order set
- % receiving pharmacologic prophylaxis, mechanical prophylaxis
- % adherence to mechanical prophylaxis
Different Types of Metrics in VTE Prevention Efforts

• Outcomes
  – # of patients with Hospital-Acquired VTE (HA VTE)
  – Rate of HA VTE per 1000 days or 1000 discharges
  – % of HA VTE that were potentially preventable

• Balancing Measures
  – Bleeding incidence
  – Heparin-induced Thrombocytopenia incidence
  – Cost (Savings)


VTE Protocol Key Principles

1. Keep protocol simple to access and use
2. Don’t interrupt the workflow
3. Design reliability into the new process
4. Monitor use of your protocol
5. Allow for variation from the protocol based on patient characteristics (rather than providers)
   - improve protocol based on feedback and justifiable variation
6. Fail faster (pilot small scale w/ongoing feedback & refinement before wider implementation)
High Reliability Principles

• **Standardize** VTE and anticoagulation risk assessment into the process of admission and transfers
• “**Opt out”** of default choices (not opt in)
• **Prompts** for VTE risk assessment at point-of-care
• **Scheduled** reassessments
• **Redundant** responsibility and prompts

Strategies to Improve Prophylaxis Rates

• **BASIC INTERVENTIONS**
  – In-services
  – Newsletters
  – Quality improvement presentations

Optimize Strategies for Effective VTE Prevention

- Alert Systems
  - Electronic alerts (E-alerts)
  - Human alerts
- Computerized decision support
- Raising situational awareness
- Audit and feedback
- Measure-vention

**MEASURE-VENTION**

Daily measurement drives concurrent intervention

Identify patients not receiving VTE prophylaxis in real time

- Ongoing assessment, creates data, reports data
- Use for real-time intervention
2 Common Questions and Biased Answers

Q. What is the best VTE risk assessment model?
A. Simple, text based model with only 2-3 layers of VTE Risk

Q. Who should do the VTE risk assessment?
A. Doctors (via admit transfer order sets), with back up risk assessment by front line nurses or pharmacists, focusing on those without prophylaxis.

Key Points - Recommendations

- VTE Risk Assessment embedded in order sets
- Simple risk stratification schema, based on VTE-risk groups (2-3 levels of risk should do it)
- Customization for some services is desirable.
- Simple measures for adequate VTE prophylaxis – More detail on selected patients
- Follow Outcomes
- Work on adherence to ordered prophylaxis
- Use measure-vention to accelerate improvement
- Share information / comparing notes helps

The Joint Commission

- VTE-1 Venous Thromboembolism Prophylaxis
- VTE-2 Intensive Care Unit Venous Thromboembolism Prophylaxis
- VTE-3 Venous Thromboembolism Patients with Anticoagulation Overlap Therapy
- VTE-4 Venous Thromboembolism Patients Receiving Unfractionated Heparin with Dosages/Platelet Count Monitoring by Protocol
- VTE-5 Venous Thromboembolism Discharge Instructions
- VTE-6 Incidence of Potentially-Preventable Venous Thromboembolism

http://www.jointcommission.org/assets/1/6/Venous%20Thromboembolism.pdf

The Joint Commission on VTE

<table>
<thead>
<tr>
<th>Risk Assessment/ Prophylaxis</th>
</tr>
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<tbody>
<tr>
<td>1. Documentation of VTE risk assessment/prophylaxis within 24 hr of hospital admission</td>
</tr>
<tr>
<td>2. Documentation of VTE risk assessment/prophylaxis within 24 hr after admission to or transfer to ICU</td>
</tr>
</tbody>
</table>

| Treatment
Outcomes |
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Incidence of potentially-preventable venous thromboembolism</td>
</tr>
</tbody>
</table>

The Joint Commission. Venous thromboembolism (VTE) core measure set.
Extended Prophylaxis

• Cancer surgery: 4 weeks
• 2008 ACCP
  – THR: 10 days to 35 days
• 2007 AAOS
  – ASA up to 6 weeks
  – LMWH: 7-12 days
  – Warfarin 2-6 weeks
• 2011 AAOS
  – Unable to make recommendations
• 2012 ACCP
  – 10-14 days orthopedic, hip fracture, THR/TKR
  – Up to 35 days

Bottom line

• VTE prevention: safe/effective/cost effective
• Do Risk assessment/Bleeding assessment
• Quality Improvement team, using deliberate QI strategy
• High reliability strategies: “measure-vention”
• Earlier VTE treatment makes recurrence and PTS less likely
• New treatment options will reduce LOS and often avoid hospitalization altogether