Boston Experience: Benchmark for the Nation

NSQIP Surgeon Champion Call
January 22, 2015

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Vice Chair, Department of Surgery
I have no relevant financial relationships or conflicts of interest to disclose.
Boston Medical Center

Merger of Boston City Hospital and University Hospital in 1996

Principle teaching hospital of Boston Univ. School of Medicine

An urban, academic, safety-net hospital (509 licensed beds)

One-quarter of patients do not speak English

Racial and ethnic minorities constitute 70% of all patients

Half of patients have an annual income below $20,000
Overall* 30-Day Mortality AY 2009

Observed Rate: 0.84%
Expected Rate: 1.2%
O/E Ratio: 0.70
Status: As Expected

* Includes General and Vascular Surgery Operations
Overall* VTE (DVT/PE) AY 2009

Observed Rate: 1.89%
Expected Rate: 0.7%
O/E Ratio: 2.70
Status: Needs Improvement

* Includes General and Vascular Surgery Cases
VTE Working Group

Composition
- Surgery (Attending Surgeons and Residents)
- Anesthesia
- Nursing
- Quality Improvement
- NSQIP Team
- Internal Medicine, Cardiovascular
- Pharmacy

Goals
- Understand hospital practices
- Review literature on VTE risk assessment and prevention
- Establish standardized suite of VTE prevention guidelines

Consensus
- Early frequent mobilization
- Standardized risk assessment
- Risk-based prophylaxis
- Electronic automation
VTE Events as Public Health Threat

900,000 annual incidence of VTE in USA; 300,000 are PE

Some have estimated attributable cost at $18,310 per occurrence

Third most common safety event in hospitalized patients

Agency for Healthcare Research and Policy: VTE prevention represents the most significant opportunity to improve patient safety in hospitals among 79 patient safety practices, because of efficacy, cost-effectiveness, and benefit-risk ratio

Fatality rate of PE in patients receiving chemoprophylaxis after operations is just 0.15%
VTE Prophylaxis

Comprehensive guidelines from the American College of Chest Physicians have been published

Effective mechanical and pharmacologic prophylaxes are available

High risk patients may require extended prophylaxis, including after discharge

Prophylaxis measures are often underutilized

A large multinational study revealed that only 59% of surgical patients receive evidence-based VTE prophylaxis

Electronic reminders increased VTE prophylaxis from 15% - 34%

Scoring Systems

American College of Chest Physicians (CHEST)
Well’s Scoring System
Autur DVT Risk Assessment and Score
Risk Assessment and Profile Score (RAP)
Cafferata Scoring System
Thrift Consensus Group

Caprini
The Caprini Score

Comprehensive VTE risk assessment championed by Joseph Caprini and colleagues

Recognizes that numerous factors confer differing degrees of hazards and assigns relative values to those attributes to derive an estimate of VTE likelihood

Assigns a score and places patients into one of five risk categories (lowest, low, moderate, high, highest)

Caprini score has been shown to accurately predict the chances of a VTE in surgery patients and has guided prophylaxis decisions

### Validation of Caprini Predictive Value

<table>
<thead>
<tr>
<th></th>
<th>Caprini 3-4</th>
<th>Caprini 5-6</th>
<th>Caprini 7-8</th>
<th>Caprini &gt;8</th>
</tr>
</thead>
<tbody>
<tr>
<td>General/Vascular/GU</td>
<td>1.0 %</td>
<td>1.3 %</td>
<td>2.6 %</td>
<td>6.5 %</td>
</tr>
<tr>
<td>Plastic Surgery</td>
<td>0.6 %</td>
<td>1.3 %</td>
<td>2.7 %</td>
<td>11.3%</td>
</tr>
<tr>
<td>Otolaryngology/HNS</td>
<td>0.2 %</td>
<td>0.9 %</td>
<td>2.4 %</td>
<td>18.3%</td>
</tr>
</tbody>
</table>

4-7% of plastic surgeons have had patients die from post-operative PE
2.2% VTE rate after mastectomy with flap

Why Caprini?

Prophylaxis is patient-specific

Less underestimation of risk

Well-validated
<table>
<thead>
<tr>
<th>Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>General/Vascular Surgery (Non-Operative) Admission</td>
</tr>
<tr>
<td>General/Vascular Surgery Post Op Order Set</td>
</tr>
<tr>
<td>General/Vascular Surgery Pre-Operative (Holding Area) Order Set</td>
</tr>
</tbody>
</table>
# Pre-Operative Order Sets

## VTE Prophylaxis

<table>
<thead>
<tr>
<th>Risk Factor Score</th>
<th>Considerations</th>
<th>Risk Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Risk</td>
<td>Please remember a 7-10 day (total post-op) course of anti-coagulation for VTE prophylaxis</td>
<td>Nasocorne veins</td>
</tr>
<tr>
<td>Low Risk</td>
<td></td>
<td>Anticoagulation contraindicated for VTE</td>
</tr>
</tbody>
</table>

### Lowest Risk

<table>
<thead>
<tr>
<th>Order</th>
<th>Notes</th>
<th>Dose</th>
<th>Dose</th>
<th>UDM</th>
<th>Route</th>
<th>Freq</th>
<th>Reason for Dalteparin Use</th>
<th>Special Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambulate</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

### Low Risk

- **Choose one - 3 item(s)**
  - Compression Boots
  - Heparin Injection (5000 units/ml) For BMI > 40, use 7500 units
  - Dalteparin Injection VTE Prophylaxis For BMI > 40, use 7500 units

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<tr>
<td></td>
<td></td>
<td>5000</td>
<td>unit</td>
<td>Subcut</td>
<td>q8h</td>
<td>periotherapeutically and during hospitalization</td>
<td></td>
<td></td>
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### Moderate Risk

- **Choose one Medication - 3 item(s)**
  - Compression Boots
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### Highest Risk

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**Venous Thromboembolism (VTE) Risk Factor Assessment**

**Assessments in Last 30 Days**
- Patient taking oral anticoagulants, platelet inhibitors (e.g., NSAIDS, Clopidogrel, Salicylates)
- Obesity (BMI > 30), Central Venous access, Positive Prothrombin 20210A

**Today's Assessment**
- Date: 11/28/2011
- Location: H4EOF-8
- Score: 7
- Level: High Risk

**Anticoagulants: Factors Associated with Increased Bleeding**
- Patient is experiencing active bleeding
- Patient has (or has had history of) heparin-induced thrombocytopenia
- Patient's platelet count <100,000/mm3
- Patient taking oral anticoagulants, platelet inhibitors (e.g., NSAIDS, Clopidogrel, Salicylates)
- Patient's creatinine clearance is abnormal. Value:

**Potential contraindications to Intermittent Pneumatic Compression (IPC)**
- Patient has severe peripheral Arterial disease
- Patient has congestive heart failure
- Patient has an acute superficial/deep vein thrombosis

**A1: Each Risk Factor Represents 1 Point**
- Age 40-59 years
- Minor surgery planned*
- History of prior major surgery (<1 month)
- Varicose veins
- History of inflammatory bowel disease
- Swollen legs (current)
- Obesity (BMI > 30)
- Acute myocardial infarction (<1 month)
- Congestive heart failure (<1 month)
- Sepsis (<1 month)
- Serious acute lung disease incl. pneumonia (<1 month)
- Abnormal pulmonary function (chronic obstructive pulmonary disease)
- Medical patient currently at bed rest

**A2: For Women Only (Each Represents 1 Point)**
- Oral contraceptives or hormone replacement therapy
- Pregnancy or postpartum (<1 month)
- History of unexplained stillborn infant, recurrent spontaneous abortion (≥3), premature birth with toxemia of pregnancy or growth restricted infant

**B: Each Risk Factor Represents 2 Points**
- Age 60-74 years
- Major surgery (>45 minutes)*
- Arthroscopic surgery*
- Laparoscopic surgery (>45 minutes)*
- Leg plaster cast or brace
- Central Venous access
- Prior cancer (except non-melanoma skin)
- Present Cancer (except breast or thyroid)
- Patient confined to bed (>72 hrs)

**C: Each Risk Factor Represents 3 Points**
- Age 75 years or more
- History of DVT/PE
- Family History of DVT/PE
- Present chemotherapy
- Positive Factor V Leiden
- Positive Prothrombin 20210A
- Elevated serum homocysteine
- Positive Lupus anticoagulant
- Elevated antithrombin antibodies
- Heparin-induced thrombocytopenia (HIT)
- Other thrombophilia-Type

**D: Each Risk Factor Represents 5 Points**
- Major Surgery lasting over 6 hours*
- Elective major lower extremity arthroplasty
- Hip, pelvis or leg fracture (<1 month)
- Stroke (<1 month)
- Multiple trauma (<1 month)
- Acute spinal cord injury (paralysis) (<1 month)
### Pre-Operative Order Sets

#### VTE Prophylaxis

<table>
<thead>
<tr>
<th>Current Risk Factor Score</th>
<th>VTE Prophylaxis Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. High Risk</td>
<td>Please remember a 7-10 day (total post-op) course of anticoagulation for VTE prophylaxis</td>
</tr>
</tbody>
</table>

#### Lowest Risk

- **Order:** Ambulate
- **Notes:**
- **Dose:**
- **UOM:**
- **Route:**
- **Freq:**
- **Reason for Dalteparin Use:**
- **Special Instructions:** early

#### Low Risk

Choose one - 3 item(s)

- **Compression Boots**
- **Heparin Injection (5000 unit/ml):** For BMI > 40, use 7500 units
- **Dalteparin Injection VTE Prophylaxis:** For BMI > 40, use 7500 units

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#### Moderate Risk

Choose one Medication - 3 item(s)

- **Compression Boots**
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#### High Risk

- **Compression Boots**

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- **Heparin Injection (5000 unit/ml):** For BMI > 40, use 7500 units
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<td></td>
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</tbody>
</table>
Opting Out

Anticoagulation contraindicated for VTE

because of

Active bleeding
Risk of hemorrhage outweighs risk of VTE
Attending/Surgeon's decision
HIT or heparin allergy - Call pharmacy for substitutes
<table>
<thead>
<tr>
<th>Caprini Score</th>
<th>Risk Category</th>
<th>Recommended Prophylaxis</th>
<th>Recommended Duration of Chemoprophylaxis</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Lowest</td>
<td>Early frequent ambulation only, OR At discretion of surgery team: Compression boots OR Low dose heparin OR Low molecular weight heparin</td>
<td>During hospitalization</td>
</tr>
<tr>
<td>1-2</td>
<td>Low</td>
<td>Compression boots OR Low dose heparin OR Low molecular weight heparin (Choose one item)</td>
<td>During hospitalization</td>
</tr>
<tr>
<td>3-4</td>
<td>Moderate</td>
<td>Compression boots AND Low dose heparin OR Low molecular weight heparin (Choose one medication)</td>
<td>During hospitalization</td>
</tr>
<tr>
<td>5-8</td>
<td>High</td>
<td>Compression boots AND Low dose heparin OR Low molecular weight heparin (Choose one medication)</td>
<td>7 – 10 days total</td>
</tr>
<tr>
<td>≥9</td>
<td>Highest</td>
<td>Compression boots AND Low dose heparin OR Low molecular weight heparin (Choose one medication)</td>
<td>30 days total</td>
</tr>
</tbody>
</table>
Mandatory Electronic Risk Assessment System and Prophylaxis

Check box format

Score automatically calculated

Mandatory for every patient

Score must be calculated before completing preop and postop orders

e-Reminder at discharge
## VTE Prophylaxis Compliance

<table>
<thead>
<tr>
<th>Risk Category</th>
<th>Compliance with Recommended Prophylaxis</th>
<th>Contraindication</th>
<th>Surgeon Discretion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low - Moderate</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>High</td>
<td>89%</td>
<td>1%</td>
<td>10%</td>
</tr>
<tr>
<td>Highest</td>
<td>77%</td>
<td>23%</td>
<td>0%</td>
</tr>
</tbody>
</table>

No patient received inappropriate or inadequate prophylaxis without electronic documentation. We cannot confirm compliance at home.
BMC General Surgery Pulmonary Embolism

- I COUGH: August 2010
- Caprini: February 2011

Raw Data (%)

- BMC General and Vascular Surgery
- BMC General Surgery
- Comparable Hospitals General and Vascular Surgery

July 2008-June 2009
July 2009-June 2010
July 2010-June 2011
July 2011-June 2012
July 2012-June 2013
July 2013-June 2014
Caprini VTE Risk Stratification and Prophylaxis at BMC

General Surgery  Multiple trauma patients
Vascular Surgery  Orthopedic Surgery (modified)
Otolaryngology  Obstetrics
Urology  Gynecology (modified)
Thoracic Surgery  Medical services interested
Plastic Surgery  Extramural collaborations
EPIC ?
### Caprini Assessment

<table>
<thead>
<tr>
<th>Factor</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anticoagulants:</strong> Factors associated with increased bleeding</td>
<td></td>
</tr>
<tr>
<td>Pt experiencing active bleeding</td>
<td></td>
</tr>
<tr>
<td>Pt Platelet count &lt; 100,000/mm³</td>
<td></td>
</tr>
<tr>
<td>Pt Creatinine Clearance is abnormal</td>
<td></td>
</tr>
<tr>
<td><strong>Patient contraindications to Intermittent Pneumatic Compressions (IPC)</strong></td>
<td></td>
</tr>
<tr>
<td>Pt has severe peripheral arterial disease</td>
<td></td>
</tr>
<tr>
<td>Pt has congestive heart failure</td>
<td></td>
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<td>Pt has an acute superficial/dvt thrombosis</td>
<td></td>
</tr>
<tr>
<td><strong>Each risk factor represents one point</strong></td>
<td></td>
</tr>
<tr>
<td>Age 40-59 years</td>
<td></td>
</tr>
<tr>
<td>History of Major Surgery (&lt;1 month)</td>
<td></td>
</tr>
<tr>
<td>Swollen legs (current)</td>
<td></td>
</tr>
<tr>
<td>Congestive Heart Failure (&lt;1 month)</td>
<td></td>
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<tr>
<td>Abnormal pulmonary function (COPD)</td>
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<td><strong>Each Risk Factor Represents 2 Points</strong></td>
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<tr>
<td>Age 60-74 years</td>
<td></td>
</tr>
<tr>
<td>Laparoscopic Surgery (&gt;45 Minutes)</td>
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<td>Major Surgery (&gt;45 Minutes)</td>
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<td>Prior Cancer (except non-melanoma skin)</td>
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<td><strong>Each Risk Factor Represents 3 Points</strong></td>
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<td>Age 75 years or more</td>
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</tr>
<tr>
<td>History of DVT/PE</td>
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</tr>
<tr>
<td>Family history of DVT/PE</td>
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<tr>
<td><strong>Each Risk Factor Represents 5 Points</strong></td>
<td></td>
</tr>
<tr>
<td>Major Surgery lasting over 6 hours</td>
<td></td>
</tr>
<tr>
<td>Elective major lower extremity arthroplasty</td>
<td></td>
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<tr>
<td>Hj, pelvic, and leg fractures (&lt;1 month)</td>
<td></td>
</tr>
<tr>
<td>Acute Spinal Cord Injury (Paralysis) (&lt;1 month)</td>
<td></td>
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</tbody>
</table>

**POST-OP REASSESSMENT - Have Caprini risk factors changed during surgery?**

- Yes
- No

**DISCHARGE REASSESSMENT - Have Caprini risk factors changed during surgery or admission?**

- Yes
- No
While the Caprini scoring system has been well validated in terms of its predictive value for VTE, to our knowledge this is the first study to demonstrate a reduction of VTE events based upon its standardized and required use, in conjunction with a formal mobilization program.

Keys to Success

Standardization (variability is the enemy of efficiency)

Risk assessment, with individualized risk-stratified care

Relatively few, broadly applicable order sets (pre-op and post-op)

Seek simplicity, automation, and greatest opportunities

Ongoing education: Patients, families, nurses, staff, surgeons

Applicable to many specialties (not just General Surgery)

DON’T GIVE UP
Strategies for Sustaining Momentum and Achieving Safer, Cost-Effective Care

Continuous performance evaluation, along with continuous and constructive performance feedback to nurses and physicians

Linking performance to outcome measures

Ongoing education about quality principles

Uniform standards among specialties and subspecialties

Establishing commitment to quality as the essence of culture

Right personnel and leadership
Some of Our Team