Postoperative Venous Thromboembolism prevention in thoracic surgery: implementing the Caprini RAM

Helene Sterbling1, MA; Krista J. Hachey, MD1,2,3; Daniel S. Choi, MA; Philip D. Hewes, MD, BSE1; Emma Pinjic, MD, MPH1; Hiran C. Fernando, MD1; Virginia R. Little, MD1.2

1Boston University School of Medicine, Boston, MA, USA; 2Boston Medical Center, Boston, MA, USA; 3Boston University General Surgery Training Program, Boston, MA, USA

Introduction & Background

• The risk of death from a postoperative venous thromboembolism (VTE) can reach 20% in thoracic surgery patients.3-4
• About 30% of post-surgical VTE events occur after hospital discharge5-6
• An internal audit of 2005-2013 lung resections at BMC showed a postoperative 60-day VTE incidence of 5.2%, of which 1/3 occurred after discharge7
• Extended course prophylaxis with enoxaparin (Iovenox) anticoagulation for up to 30 days can reduce the rate of VTE events by up to 60%5,6
• The Caprini Risk Assessment Model (RAM) is a VTE risk stratification tool used to determine duration of prophylactic anticoagulation in surgical patients:
  - Low risk patients (RAM score 0–4) receive routine inpatient prophylaxis and no additional post-discharge anticoagulation
  - Intermediate risk patients (score 5–8) receive 10 total days of postoperative anticoagulation prophylaxis, including post-discharge days
  - High risk patients (score ≥9) receive 30 total days of postoperative anticoagulation prophylaxis including post-discharge days

Table A. Caprini Risk Assessment Model

<table>
<thead>
<tr>
<th>Quality Metric</th>
<th>Frequency (n=149)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Care team performed Caprini risk assessment prior to discharge</td>
<td>99.3% (148/149)</td>
</tr>
<tr>
<td>Care team prescribed appropriate prophylaxis based on score</td>
<td>97.3% (144/148)</td>
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</tbody>
</table>

Results

A total of 151 patient charts (154 procedures were reviewed for Caprini score compliance, and available patient surveys were graded for comprehension.

Table B. Provider Adherence with Risk Assessment and Recommendations

<table>
<thead>
<tr>
<th>Quality Metric</th>
<th>Frequency (n=83)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient attributes all prescribed doses of anticoagulation after hospital discharge</td>
<td>97.6% (81/83)</td>
</tr>
<tr>
<td>Patient demonstrates comprehension of purpose for extended course prophylaxis after discharge</td>
<td>72.3% (50/83)</td>
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</tbody>
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Conclusions & Lessons Learned

• The multidisciplinary thoracic service at Boston Medical Center successfully adopted the Caprini RAM with provider adherence rates of over 90%
• Patient adherence to post-discharge prophylaxis is high, reinforcing the feasibility of this protocol for patients treated at a safety net hospital, such as Boston Medical Center, which serves a diverse and predominantly disadvantaged patient population. Variability in patient knowledge regarding risks associated with VTE and prolonged anticoagulation suggests improvements in patient education are needed.
• Extended course prophylactic anticoagulation with enoxaparin (Iovenox) demonstrated preliminary safety among a diverse thoracic surgical cohort, including lung resection, esophagectomy, esophageal funduplications and other procedures.
• Thus far, the overall postoperative VTE rate is 1.95%, with no outpatient VTE events. Improvements in VTE rate among lung resections for cancers are evident. Follow up studies are needed to demonstrate the statistical significance of these preliminary findings

Next Steps

• With the integration of the Caprini scoring system into the hospital’s electronic medical record platform, the use of the Caprini RAM is simple and accessible. Still, an more in-depth interface could help:
  - Facilitate the calculation of the Caprini score by drawing available information from the patient’s EMR
  - Calculate any remaining anticoagulation prophylaxis days required upon discharge
  - The further education of patients at intermediate and high postoperative VTE risk is imperative. A better understanding of the risks and treatments associated with poor outpatient prophylaxis could lead to a higher adherence rate among these at-risk patient groups.
• The use of extended course enoxaparin prophylaxis in a thoracic surgical unit was safe and feasible in this prospective pilot study. Next, a multicenter trial should be initiated to monitor the sustainability of the Caprini RAM system in large-scale and diverse thoracic surgery settings.

References:


Table C. Patient Adherence to Prophylaxis Recommendations

Aim #1: Assign a Caprini score to at least 90% of thoracic surgery patients prior to discharge
Aim #2: Prescribe appropriate postoperative anticoagulation prophylaxis based on Caprini score at least 90% of thoracic surgery patients
Aim #3: Implement patient adherence audits at postoperative clinic visits with goal of 90% adherence rate
Aim #4: Ensure that at least 90% of patients discharged with anticoagulation prophylaxis understand the purpose of the extended course of treatment
Aim #5: Decrease postoperative VTE outcomes after Caprini implementation

Methods

1. Evaluate Caprini RAM implementation on the thoracic surgical service and provider adherence to the RAM protocol:
   - Aim #1: Assign a Caprini score to at least 90% of thoracic surgery patients prior to discharge
   - Aim #2: Prescribe appropriate postoperative anticoagulation prophylaxis based on Caprini score at least 90% of thoracic surgery patients
2. Evaluate patient adherence to the anticoagulation protocol as well as comprehension of extended prophylaxis treatment:
   - Aim #3: Conduct patient adherence audits at postoperative clinic visits with goal of 90% adherence rate
   - Aim #4: Ensure that at least 90% of patients discharged with anticoagulation prophylaxis understand the purpose of the extended course of treatment
3. Decrease postoperative VTE outcomes after Caprini implementation:
   - Aim #5: Decrease the pre-intervention VTE rate in thoracic postoperative patients by 45%

Table: Aims & Next Steps

All lung cases Inpatient Outpatient
Pre-intervention VTE rates 6.0% 5.0% 4.0%
VTE rate goal 6.0% 5.0% 4.0%
Post-intervention VTE rates 0.0% 1.0% 2.0%

Figure: Pre- vs Post-intervention VTE rates in lung resection patients

No post-intervention VTE event in the outpatient setting