Paper Seminar Presentation

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Project Statement

• Develop a clinician performance review tool for risk-appropriate VTE prophylaxis
  • Keeps track of clinician compliance
  • Ranks anonymous clinician adherence
  • Combine the information with output from the APL NLP algorithm
  • Automated retrospective analysis on past prophylaxis data
Impact of a venous thromboembolism prophylaxis “smart order set”: Improved compliance, fewer events

Amer M. Zeidan, Michael B. Streiff, Brandyn D. Lau, Syed-Rafay Ahmed, Peggy S. Kraus, Deborah B. Hobson, Howard Carolan, Lambrianidi Chryso, Paula B. Horn, Kenneth M. Shermock, Gabriel Tinoco, Salahuddin Siddiqui, and Elliott Haut

Why? The paper was chosen because it gives additional background information about our project as well as gives actual statistics on the effectiveness of the VTE CDS tools
Background Information

• The majority of patients who suffer from VTE are medical patients
  • Decrease the risk with VTE prophylaxis treatment
  • Many hospitalized patients do not receive risk-appropriate prophylaxis.

**Problem:** In 2005, suboptimal VTE prophylaxis practices noticed in the Johns Hopkins Hospital
Development of “smart order set”

- VTE risk stratification and prophylaxis recommendation tool
  - Used for all admitted medically ill patients
  - Two checklists
  - Shows optimal risk-appropriate choice for VTE prophylaxis
  - Opt-in

**Hypothesis:** The implementation of a VTE prophylaxis “smart order set” would increase order for risk-appropriate VTE prophylaxis and decrease VTE events without compromising safety
Simplified Flowchart of the Smart Order Set

*Major VTE Risk

- Yes: Use mechanical prophylaxis until contraindication no longer present. Review patient status daily
- No: Heparin 5000 units subcutaneously q8 hours

- Contraindications
  - Yes: Heparin 5000 units subcutaneously q12 hours
  - No: Use mechanical prophylaxis until contraindication no longer present. Review patient status daily

- Major Risk Factors
  - Age older than 60 years
  - Cancer (active or on chemotherapy)
  - Previous VTE
  - Acute Cerebrovascular event with paresis (within last 3 months)
  - Thrombophilia
  - Decompensated New York Heart Association (NYHA) Class III/IV congestive heart failure
  - Respiratory failure (ventilator-dependent)
  - Clinically-significant infection/sepsis

- Contraindications
  - High risk of bleeding
  - Active bleeding
  - Systemic anticoagulation
  - INR ≥ 1.5 or aPTT ratio ≥ 1.3
Methodology

• Retroactive cohort study of patients
  • During November 2007 (1 month prior to smart order set activation)
  • And April 2010 (1 month prior to data collection)
• The EPR and CPOE system manually reviewed
• Compared VTE prophylaxis patients pre and post-implementation
  • Using chi squares and t tests
  • Compared patient demographics, risk factors, and contraindications
## Key Results: Prescription of VTE prophylaxis

<table>
<thead>
<tr>
<th></th>
<th>Preimplementation (N = 1,000)</th>
<th>Postimplementation (N = 942)</th>
<th>(P)-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total receiving risk-appropriate VTE Prophylaxis</td>
<td>656 (65.6%)</td>
<td>849 (90.1%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Total Receiving Any Form of VTE Prophylaxis</td>
<td>764 (76.4%)</td>
<td>901 (95.6%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Heparin 5000 Units SQ BID</td>
<td>140 (14.0%)</td>
<td>302 (32.1%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Heparin 5000 Units SQ TID</td>
<td>439 (43.9%)</td>
<td>327 (34.7%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Enoxaparin 40 mg SQ Daily</td>
<td>8 (0.8%)</td>
<td>1 (0.1%)</td>
<td>0.0394</td>
</tr>
<tr>
<td>Mechanical Prophylaxis (only)</td>
<td>57 (5.7%)</td>
<td>189 (20.1%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Therapeutic Anticoagulation</td>
<td>120 (12.0%)</td>
<td>82 (8.7%)</td>
<td>0.0213</td>
</tr>
<tr>
<td>Total receiving any form of pharmacologic VTE prophylaxis including therapeutic anticoagulation</td>
<td>707 (70.7%)</td>
<td>712 (75.6%)</td>
<td>0.0176</td>
</tr>
<tr>
<td>Not receiving any form of VTE prophylaxis</td>
<td>236 (23.6%)</td>
<td>41 (4.4%)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

\(N\), number; SQ, subcutaneous; BID, twice daily; TID, thrice daily; VTE, venous thromboembolism
### Key Results: Clinical outcomes

<table>
<thead>
<tr>
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<th>Preimplementation N = 1,000</th>
<th>Postimplementation N = 942</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total VTE episodes</td>
<td>25 (2.5%)</td>
<td>7 (0.7%)</td>
<td>0.0022</td>
</tr>
<tr>
<td>Preventable harm from VTE</td>
<td>11 (1.1%)</td>
<td>0 (0)</td>
<td>0.001</td>
</tr>
<tr>
<td>Total in-house VTE</td>
<td>5 (0.5%)</td>
<td>5 (0.5%)</td>
<td>1.0000</td>
</tr>
<tr>
<td>Total 30-day post-discharge VTE</td>
<td>9 (1.1%)</td>
<td>2 (0.3%)</td>
<td>0.0300</td>
</tr>
<tr>
<td>Total 90-day post-discharge VTE</td>
<td>20 (2.7%)</td>
<td>2 (0.3%)</td>
<td>0.0003</td>
</tr>
<tr>
<td>Fatal PE</td>
<td>2 (0.2%)</td>
<td>1 (0.1%)</td>
<td>1.000</td>
</tr>
<tr>
<td>Anatomic location of VTE episodes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower extremity DVT</td>
<td>14 (1.4%)</td>
<td>3 (0.3%)</td>
<td>0.0130</td>
</tr>
<tr>
<td>Upper extremity DVT</td>
<td>6 (0.6%)</td>
<td>1 (0.1%)</td>
<td>0.1255</td>
</tr>
<tr>
<td>PE (± DVT)</td>
<td>5 (0.5%)</td>
<td>3 (0.3%)</td>
<td>0.7270</td>
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<tr>
<td>Major bleeding episodes</td>
<td>3 (0.3%)</td>
<td>1 (0.1%)</td>
<td>0.6253</td>
</tr>
<tr>
<td>In-hospital all-cause mortality</td>
<td>13 (1.3%)</td>
<td>19 (2.0%)</td>
<td>0.2845</td>
</tr>
</tbody>
</table>

VTE, venous thromboembolism; DVT, deep venous thrombosis; PE, pulmonary embolism; N, number.
Significance of Key Results

• Patient harm when not compliant
• Emphasizes importance of risk stratification tools
• Risk-appropriate prophylaxis does not compromise patient safety
Conclusion

- Smart order sets reduce the number of VTE occurrences in hospitalized patients
- No increase in frequency of prophylaxis associated bleeding

**Future directions:** Incorporate alert function for prompt risk factor reassessment and a real-time provider report card
Personal Assessment

• Shows the importance of risk-appropriate prophylaxis

• However
  • Small number of positive results may make the results less generalizable
  • Does not figure into whether or not nurses actually carried out the prescribed intervention
  • Small scope: only medically ill patients.

Future direction: Automate a clinician report tool to increase compliance as well as give retrospective data analysis. Also, combine the results from the clinician report tool with the APL VTE NLP tool to generate more conclusive statistics on the efficacy of the smart order set in a broader range of patient populations.