Is Routine Use of VTED Chemical Prophylaxis Ever Warranted in Foot and Ankle Surgery?: Results of a Cost-effectiveness Analysis

Adam Fleischer, DPM, MPH; Craig Wirt, PhD; Richmond Robinson, DPM; Carolina Barbosa, PhD; Arezou Amidi, DPM; Shirley Chen, BS; Robert Joseph, DPM, PhD

Center for Lower Extremity Ambulatory Research (CLEAR), Dr. Wm. M Scholl College of Podiatric Medicine at Rosalind Franklin University of Medicine and Science, North Chicago, IL

Introduction

Venous thromboembolism disease (VTED) affects 300,000 to 600,000 people and is the proximate cause of more than 60,000 deaths each year in the United States (1).

• A surgery is a recognized risk factor for VTED (1).

• While low molecular weight heparin (LMWH) is routinely prescribed following hip and knee replacement surgery, it is infrequently used following foot/ankle surgery.

• The recent ACFAS Clinical Consensus Statement (2) suggests that routine chemical prophylaxis is not warranted when caring for foot/ankle disorders; instead, patients should be risk stratified by their provider and have a VTED prevention plan (which may or may not include use of LMWH) tailored to their individual risk level.

• Because the rate of VTED development varies greatly in foot/ankle surgery (e.g., the rate of distal, asymptomatic DVT varies anywhere from 4% with hallux valgus surgery [3] to as much as 36% after Achilles tendon surgery [4]), we postulated that the decision to provide pharmacologic prophylaxis, from a cost-effectiveness perspective, may be entirely explained by the type of foot/ankle surgery performed, regardless of patient factors (e.g., medications, comorbidities, etc.).

Study Objective

To evaluate the cost-effectiveness of routinely using LMWH x 4 weeks to prevent VTED during the postoperative period after five commonly performed foot/ankle surgical procedures:

1. Achilles tendon repair (ATR)
2. Total ankle replacement (TAR)
3. Hallux valgus surgery (HVS)
4. Hindfoot arthrodesis (HA)
5. Ankle fracture surgery (AFS)

In the initial analysis we assumed maximal benefit and least harm with LMWH use:

• DVT rate (asymptomatic and symptomatic) is reduced by 0.51 (5)
• PE rate is reduced to 0 (5)
• Assuming the fewest possible side effects (using lowest reported rates of heparin-induced thrombocytopenia [HIT] and major hemorrhage, and not considering the effects of minor hemorrhage [i.e., minor hemorrhage rate = 0])

Methods

• We analyzed the health effects and costs associated with our two competing treatment strategies, administering Enoxaparin x 4 wks postoperatively and no prophylactic treatment.

• Base case assumption for ATR, AFS, and HVS was a 45 year old female.

• Base case assumption for TAR and HA was 60 year old female.

• Health effects, both in natural unit of outcome (e.g., number of deaths) and quality adjusted life years (QALYs), and the direct costs associated with these strategies were calculated using a decision analytic tree (TreeAge Pro Healthcare 2014) for each of the five surgical scenarios.

• The rates and probability of each health effect (tree node) were retrieved from the available literature. Summary estimates were used when more than one source was available. Direct costs were derived from published literature, drug manuals, and the Centers for Medicare and Medicaid. All costs were adjusted to reflect US dollar 2015 rates. Value tables for these estimates are available from the authors upon request.

• Costs associated with each health effect (node) include diagnostic costs and treatment costs (e.g., outpatient and inpatient costs, pharmacological treatment, and disease management).

Results

In the short-term (Table 1), routine prophylaxis was always associated with greater costs compared to no prophylaxis. For ATR, TAR, HA and AFS prophylaxis was associated with slightly better health outcomes; however, the gain in QALYs was minimal compared to the cost of prophylaxis (iCER well above $50k threshold). For HVS, prophylaxis was associated with both worse health outcomes and greater costs.

In the long-term (Table 2), routine prophylaxis was always associated with worse health outcomes. For ATR and TAR, prophylaxis resulted in slightly lower costs (about $200 less per patient over lifetime). Prophylaxis was associated with greater long-term costs (in addition to worse health outcomes) for HVS, HA and AFS.

Discussion/Conclusion

• Assuming maximal efficacy and minimal harm with LMWH use, we did not find any foot/ankle surgical condition where routine prophylaxis would be preferred. In certain surgeries (HA and AFS), but especially HVS, routine (indiscriminate) LMWH prophylaxis would likely be harmful.

• Unlike hip and knee replacement surgery, the decision to use LMWH prophylaxis should not be based solely on the type of foot/ankle surgery planned. Patient-specific risk factors (age, comorbidities) will continue to drive the decision to provide chemical prophylaxis or not.

References


Acknowledgements

This project was supported by an ACFAS Clinical and Scientific Research grant award (2014) and grant number 7235DK074390 from the National Institute of Diabetes and Digestive and Kidney Disease. The content is solely the responsibility of the authors and does not represent the official views of the National Institute of Health or ACFAS.

Table 1: Cost per QALY / Year

<table>
<thead>
<tr>
<th>Designation</th>
<th>ATR</th>
<th>TAR</th>
<th>HA</th>
<th>AFS</th>
<th>HVS</th>
</tr>
</thead>
<tbody>
<tr>
<td>No prophylaxis</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Prophylactic LMWH</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>ATR</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>TAR</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>HA</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>AFS</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>HVS</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
</tbody>
</table>

Table 2: Cost per QALY / Year

<table>
<thead>
<tr>
<th>Designation</th>
<th>ATR</th>
<th>TAR</th>
<th>HA</th>
<th>AFS</th>
<th>HVS</th>
</tr>
</thead>
<tbody>
<tr>
<td>No prophylaxis</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Prophylactic LMWH</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>ATR</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>TAR</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>HA</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>AFS</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>HVS</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
</tbody>
</table>