Anticoagulant Project

Funded by the Ontario Ministry of Health and Long-Term Care

Acknowledgements

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Medication Safety Support Service (MSSS) Advisory Group

• Ontario Ministry of Health and Long-Term Care
• Ontario College of Pharmacists
• Canadian Society of Hospital Pharmacists - Ontario Branch
• College of Physicians and Surgeons of Ontario
• Ontario Medical Association
• Ontario Hospital Association
• Institute for Safe Medication Practices Canada
• Registered Nurses Association of Ontario
• College of Nurses of Ontario
• Ontario Pharmacists’ Association

Anticoagulation Strategies

Need to Anticoagulate…..

Need to Anticoagulate SAFELY…..

Anticoagulation Strategies

Enhance DVT VTE? prophylaxis
• “Errors of omission”

Enhance Heparin storage and administration
• “Errors of commission”
Why Heparin?

Heparin Storage – A Patient Safety Priority


- Patient with a triple lumen central venous access device
- Received heparin flush in each lumen 3 times daily
- Post op day 5, aPTT > 180 seconds
- Outcome - Intracranial hemorrhage

Case #2 - ISMP Safety Alert, September 21, 2006

- Neonatal ward in Mid Western US hospital
- Heparin 10,000 units / mL improperly stocked in dispensing cabinet for 10 units / mL vial
- Products look similar
- Nurses flushed with incorrect product
- Outcome – 3 premature infant deaths

Questions:

- Is there a problem?
- Why so many choices?
- What is the current state of heparin storage in Ontario?
- What is contributing to the current usage patterns?
- How can we improve storage?

Heparin Storage – A Patient Safety Priority


A Need to “Flush” Out High Concentration Heparin Products
Current Heparin Products

<table>
<thead>
<tr>
<th>Concentration/mL</th>
<th>Total Volume</th>
<th>Unit Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Units/mL</td>
<td>100 Units</td>
<td>1 mL</td>
</tr>
<tr>
<td>20 Units/mL</td>
<td>200 Units</td>
<td>2 mL</td>
</tr>
<tr>
<td>100 Units/mL</td>
<td>1,000 Units</td>
<td>10 mL</td>
</tr>
<tr>
<td>1,000 Units/mL</td>
<td>10,000 Units</td>
<td>100 mL</td>
</tr>
<tr>
<td>10,000 Units/mL</td>
<td>50,000 Units</td>
<td>500 mL</td>
</tr>
<tr>
<td>50,000 Units/mL</td>
<td>25,000 Units</td>
<td>1 mL</td>
</tr>
</tbody>
</table>

*High concentration product. However, unit dose ampoules provide only 5,000 units.

Heparin-Related Products

- Low Molecular Weight Heparins
  - Enoxaparin
  - Dalteparin
  - Tinzaparin
  - Nadroparin
  - Fondaparinux

Heparin Uses

<table>
<thead>
<tr>
<th>Indication</th>
<th>Heparin 1,000 units in 10 mL</th>
</tr>
</thead>
<tbody>
<tr>
<td>VTE prophylaxis</td>
<td>Heparin SC or LMWH SC</td>
</tr>
<tr>
<td>VTE treatment</td>
<td>Heparin bolus plus infusion</td>
</tr>
<tr>
<td>Acute Coronary Syndromes</td>
<td>Heparin bolus plus infusion</td>
</tr>
<tr>
<td></td>
<td>LMWH SC</td>
</tr>
<tr>
<td></td>
<td>Fondaparinux SC</td>
</tr>
</tbody>
</table>

Heparin Error Potential

- Number of products
- Number of concentrations
- Number of uses / formats

Heparin Uses

- Heparin Flushes
  - Limited evidence
  - Routine use not recommended

Current Heparin Storage

Canadian Hospital Survey
- 29 question survey sent to 856 healthcare facilities across Canada
- Addressing a variety of anticoagulant topics including heparin storage
- Response:
  - 195 responses nation-wide
  - Representing 38,350 hospital beds
Current Heparin Storage

Utilization of Heparin 1,000 units / 10 mL (100 units/mL)

<table>
<thead>
<tr>
<th>Unit</th>
<th>ICU</th>
<th>OR</th>
<th>Emergency</th>
<th>Cardiology</th>
<th>Dialysis</th>
<th>Surgery</th>
<th>Medicine</th>
<th>Pharmacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent</td>
<td>25.1</td>
<td>20.0</td>
<td>12.5</td>
<td>10.0</td>
<td>9.5</td>
<td>9.5</td>
<td>12.5</td>
<td>27.4</td>
</tr>
</tbody>
</table>

Utilization of Heparin 10,000 units / 1 mL

<table>
<thead>
<tr>
<th>Unit</th>
<th>ICU</th>
<th>OR</th>
<th>Emergency</th>
<th>Cardiology</th>
<th>Dialysis</th>
<th>Surgery</th>
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<td>9.5</td>
<td>12.5</td>
<td>27.4</td>
</tr>
</tbody>
</table>

Utilization of Heparin 50,000 units / 5 mL (10,000 units/mL)

<table>
<thead>
<tr>
<th>Unit</th>
<th>ICU</th>
<th>OR</th>
<th>Emergency</th>
<th>Cardiology</th>
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<td>12.5</td>
<td>10.0</td>
<td>9.5</td>
<td>9.5</td>
<td>12.5</td>
<td>27.4</td>
</tr>
</tbody>
</table>

Utilization of Heparin 10,000 units / 10 mL (1,000 units/mL)

<table>
<thead>
<tr>
<th>Unit</th>
<th>ICU</th>
<th>OR</th>
<th>Emergency</th>
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<th>Dialysis</th>
<th>Surgery</th>
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<td>25.1</td>
<td>20.0</td>
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<td>9.5</td>
<td>9.5</td>
<td>12.5</td>
<td>27.4</td>
</tr>
</tbody>
</table>
Current Heparin Storage

Summary

- High dose / concentration products prevalent
- Stocked with lower dose products (flushes)
- Few interventions made

Intervention

The Goal

- Ensure appropriate use of heparin
- Develop safety strategies to minimize selection errors

Recommendations

- Complete an audit of heparin storage throughout hospital
- Ensure appropriate use of heparin
- Reduce the number of potential high-risk situations in patient care areas

ISMP Canada

Resource Kit Development

- Expert advisory panel formed
- Develop process to achieve goals
- Identifying / creating tools to facilitate
  - Analysis
  - Product choices
  - Information sharing
Recommendation 1: Heparin Audit

Systematic Process for Heparin Review
1. Existing Heparin Storage
   • All patient care areas
2. Remove infrequently used products
3. Determine appropriate heparin usage
   • Standardize by indication
   • Consider limiting use of heparin flushes
4. Risk Assessment
   • Any heparin 10,000 or 50,000 unit products
   • Stocking both heparin flushes and SC / IV doses
5. Determine proposed heparin utilization
   • Limit number of products by patient area
6. Determine proposed heparin storage
   • Utilize separation, labelling and other techniques to differentiate products

Cost Analysis

Costs – Single dose

<table>
<thead>
<tr>
<th>Heparin Format</th>
<th>Cost*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heparin 1,000 units / 10 mL</td>
<td>1.90</td>
</tr>
<tr>
<td>Heparin 500 unit pre-filled syringe (Healthmark)</td>
<td>0.38</td>
</tr>
<tr>
<td>Heparin 5,000 units / 0.2 mL amp</td>
<td>1.29</td>
</tr>
<tr>
<td>Heparin 10,000 units / 1 mL vial</td>
<td>1.14</td>
</tr>
<tr>
<td>Heparin 50,000 units / 2 mL vial</td>
<td>0.92</td>
</tr>
<tr>
<td>Heparin 50,000 units / 5 mL vial</td>
<td>0.38</td>
</tr>
<tr>
<td>Heparin 500 unit pre-filled syringe (Healthmark)</td>
<td>0.87</td>
</tr>
<tr>
<td>Heparin 3,000 units / 10 mL</td>
<td>1.90</td>
</tr>
</tbody>
</table>

*Based on average contract prices

Estimated annual costs for VTE prophylaxis

<table>
<thead>
<tr>
<th>Heparin Format</th>
<th>Cost*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heparin 5,000 unit pre-filled syringe (Healthmark)</td>
<td>93,659</td>
</tr>
<tr>
<td>Heparin 5,000 units / 0.2 mL amp</td>
<td>60,410</td>
</tr>
<tr>
<td>Heparin 10,000 units / 1 mL vial</td>
<td>62,752</td>
</tr>
<tr>
<td>Heparin 50,000 units / 2 mL vial</td>
<td>43,083</td>
</tr>
<tr>
<td>Heparin 50,000 units / 5 mL vial</td>
<td>17,795</td>
</tr>
</tbody>
</table>

*Assuming average VTE prophylaxis rates in a 400 bed acute care facility

Recommendation 2: Appropriate Use

• DVT (VTE?) prophylaxis re evidence-based guidelines
  • Increase use
  • Consider LMWH use
  • Peripheral intravenous line flush
  • Decrease use

Recommendation 3: Reduce Heparin Risk

• Remove high concentration heparin
  • 50,000 units/5mL and 50,000 units/2mL vials
  • 10,000 units/1mL vials
• Develop strategy to minimize number of concentrations in patient care areas
LMWH Storage is this heparin?

- Currently either multidose vials or pre-filled syringes
- Multidose vials pose a safety threat
  - May be more concentrated
  - Represents large drug quantity per vial
- No cost differential for pre-filled syringes

Heparin Safety Strategies

Experience

Pilot Site: Toronto East General Hospital

Carmine Stumpo

Implementation

General Strategies

- Consider the Entire System of Heparin Usage
  - All formats
  - All uses
- Utilize a team approach
  - Pharmacy, Nursing, Physicians, etc....

Toronto East General Hospital Experience

- Overall heparin usage:
  - Protocol-based prescribing
  - Simplify choices
  - Promote LMWH

Implementation

Toronto East General Hospital Experience

- Comprehensive review of wardstock
  - Numerous unexpected findings
  - Removed all heparin 10,000 and 50,000 unit vials
    - Converted to prefilled heparin syringes
    - Limited heparin flush vials
    - Exception – cardiac cath lab

- Successes
  - Smooth transition
  - Dedicated technician time to standardize new storage environment
  - Well-received by nursing staff
Implementation

Toronto East General Hospital Experience

• Challenges
  • Increased cost
    • Offset with other drug savings with new generic drugs to market
  • Storage space on units
  • Understanding new utilization patterns
  • Reduced wastage

Questions?