Ontario Medication Safety Support Service
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

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

Why Anticoagulant Safety?

Anticoagulation Principles

Need to anticoagulate.....

Need to anticoagulate SAFELY.....
Addressing Anticoagulation Safety

Enhance venous thromboembolism (VTE) prophylaxis
• “Errors of omission”

Enhance storage and administration of heparin
• “Errors of commission”

Addressing Anticoagulant Safety

Enhance VTE prophylaxis:
• Project underway with Dr. Bill Geerts to improve the use of clinical practice guidelines.

Addressing Anticoagulant Safety

Enhance storage and administration of heparin.

Heparin Storage – A Patient Safety Priority

Case #1:
• Patient with a triple lumen central venous access device
• Received heparin flush in each lumen 3 times daily
• Post op day 5, aPTT greater than 180 seconds; no other anticoagulant prescribed
• Outcome: intracerebral hemorrhage resulting in death


Heparin Storage – A Patient Safety Priority

Case #2:
• Neonatal ward in US hospital
• Heparin 10,000 units / mL stocked in dispensing cabinet instead of 10 units / mL vial
• Products look similar
• Nurses flushed with incorrect product
• Outcome – 3 premature infants died

ISMP Safety Alert, September 21, 2006
Heparin Storage -
A Patient Safety Priority

Questions:
- Is there a problem?
- Why are there 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 Product Concentrations Available in Canada
(ampoules and vials only)

Heparin-Related Products

- Low Molecular Weight Heparins (LMWH)
  - Enoxaparin (Lovenox®)
  - Dalteparin (Fragmin®)
  - Tinzaparin (Innohep®)
  - Nadroparin (Fraxiparine®)
  - Fondaparinux (Arixtra®)

Heparin Uses

<table>
<thead>
<tr>
<th>Use</th>
<th>Route</th>
<th>Common Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heparin Flushes</td>
<td>Heparin IV</td>
<td>Heparin 1,000 units in 10 mL</td>
</tr>
<tr>
<td>VTE prophylaxis</td>
<td>Heparin SC or LMWH SC (E.g., Dalteparin, Tinzaparin)</td>
<td>Heparin 5,000 units SC or LMWH 2,500 to 5,000 units SC</td>
</tr>
<tr>
<td>VTE treatment</td>
<td>Heparin IV bolus plus infusion</td>
<td>Heparin 5,000 units IV followed by 1,000 units per hour (approx)</td>
</tr>
<tr>
<td>Acute Coronary Syndromes</td>
<td>Heparin IV bolus plus infusion</td>
<td>Heparin 5,000 units IV followed by 1,000 units per hour (approx)</td>
</tr>
</tbody>
</table>

Heparin Flashes
- 100 – 1000 units
- Limited evidence
- Routine use not recommended
**Heparin Error Potential**

Number of products

Number of concentrations

Number of uses / formats / doses

**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
  - 97 Ontario respondents

**Current Heparin Storage (Ontario)**

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

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

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

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

<table>
<thead>
<tr>
<th>Pharmacy</th>
<th>Medicine</th>
<th>Surgery</th>
<th>Dialysis</th>
<th>Cardiology</th>
<th>Emergency</th>
<th>OR</th>
<th>ICU</th>
</tr>
</thead>
<tbody>
<tr>
<td>44.7%</td>
<td>31.6%</td>
<td>16.8%</td>
<td>23.2%</td>
<td>38.9%</td>
<td>18.0%</td>
<td>65.2%</td>
<td>65.2%</td>
</tr>
</tbody>
</table>

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

Intervention

The Goals:
- Appropriate use of heparin
  - Before addressing heparin storage, must first address usage
- Safety strategies to minimize selection errors

Current Heparin Storage

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

Project Development

Coordination by ISMP Canada
- Expert advisory panel formed
  - Process developed to achieve goals
  - Identification / creation of tools to facilitate
    - Analysis
    - Product choices
    - Information sharing
- Resource kit developed
Learning from Project Development

• “one size does not fit all”
• Need to use a systematic approach to identify and address areas of risk

Recommendations - Overview

1. Assess heparin storage throughout hospital.
2. Address appropriate use of heparin.
3. Reduce the number of potential high-risk situations related to heparin storage.

Recommendation 1: Heparin Audit

Systematic Process for Heparin Review:
• Review products and quantities stored throughout the hospital;
• Assess intended use for each heparin product stored;
• Identify and remove unnecessary products; and
• Identify appropriate quantities to be stored.

Audit and Assessment Tool

• Step by step approach
• Documentation (pre and post)
• Impact analysis

Cost Analysis

<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>$2.00</td>
</tr>
<tr>
<td>Heparin 5,000 / 0.2 mL amp</td>
<td>$1.29</td>
</tr>
<tr>
<td>Heparin 10,000 units / 1 mL vial</td>
<td>$1.34</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 1,000 units / 10 mL</td>
<td>$1.90</td>
</tr>
</tbody>
</table>

*Based on average contract prices for a single dose.

Cost Analysis

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 / 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
LMWH Storage

- Available as both multidose vials and pre-filled syringes
- Multidose vials present a safety hazard
  - May be more concentrated
  - Large quantity of drug per vial
- No cost differential for pre-filled syringes
  - Barrier to use: need for pre-approved dose ranges

Recommendation 2: Appropriate Use

Assess current use and compare with best practice:
- Review use of unfractionated heparin to ensure alignment with the evidence based guidelines (e.g., ACCP)
- Considerations:
  - VTE prophylaxis re evidence-based guidelines
  - Increase use
  - Flushing / locking of access lines
  - Decrease use of heparin where possible
  - Consider LMWH use

Recommendation 3: Reduce Potential High-Risk Situations

A/ In patient care areas:
- Remove formats of high dose heparin products from stock in patient care areas:
  - 50,000 units/5 mL
  - 50,000 units/2 mL
- Review and reduce, where possible, availability of the following products in patient care areas:
  - 10,000 units/1 mL
  - 10,000 units/10 mL

Recommendation 3: Reduce Potential High-Risk Situations

B/ In Pharmacy:
- Review storage areas to ensure adequate safeguards to prevent selection errors.

Heparin Safety Strategies Experience

Pilot Site: York Central Hospital

Ming Lee
**Implementation**

**General Strategies**
- Motion was approved by Pharmacy, Nutrition & Therapeutics Committee and Safe Medication Practice Committee to remove high dose heparin products from stock hospital wide
  - Review of products, indications and pre-printed orders
  - Education of all staff and physicians
  - Work with all physician and nursing groups to change stock and pre-printed orders
  - Minimize stock of heparin products with individual patient specific prescriptions where possible

**York Central Hospital Experience**

**Successes**
- Increased awareness of high dose heparin risks hospital wide
- Collaboration and support of all practitioners – physicians, nurses, pharmacists and pharmacy technicians
- Adoption of revised pre-printed orders with significant practice impact (i.e. use of LMWH and premixed heparin)
- Independent double check for heparin infusions and subcutaneous injections
- Participation in the Canadian Thromboprophylaxis Patient Safety Initiative (CTPSI) helped in providing education to all physician groups, nurses and pharmacists

**Challenges**
- Time for consultation process (i.e. pre-printed orders, etc)
- Storage space on units
- Decision to use commercially available pre-filled syringe or wait for IV admixture service (redevelopment required)

**Next Steps**
- Continue to revise pre-printed orders
- Continue to consolidate stock to one of the approved products
- Decision on 5000u heparin format

**Questions?**
Questions?