IPI Research Update

Haylei Lorca
And
Pamela Morris

Regenstrief Center for Healthcare Engineering
Contents

- IPI tool usage
  - Most common charts
- Results of literature review
  - Cost of IV ADEs
  - Other comparative statistics
- Example research investigation: Heparin
- Follow up: Invitation for hospital interviews
  - To help set research direction
  - To gather case studies
IPI Usage: Analysis Charts

IPI Analyses Viewed

- Alerts Profile Pie Chart: 29
- Alerts by Month: 21
- Alerts by Time of Day: 21
- Alerts by Month by Resolution: 16
- Actions Taken by Drug or Fluid: 10
- Alerts by D/F: 8
- Alerts by Alert Types by Month: 6
- Alerts by Month Line Graph: 3
- Alerts by Time of Day by Resolution: 1
- Alerts by Month by Profile: 1
IPI Usage: Comparison Charts

IPI Comparisons Viewed

- Actions by D/F: 31
- Alerts By Alert Type by Month: 15
- Alerts by D/F: 8
- Alerts by Month: 5
- Alerts by Time of Day: 8
- Alerts Profile Pie Chart: 6
- Alerts by Type Pie Chart: 14
Literature Search

- For your reference: bibliography in your packet
- Facts:
  - ADEs with IV Drugs are 35 to 54 percent of all ADEs (2000, 2004)
  - Smart pumps avert serious ADEs every 2.6 days, and a moderate to significant event every 1.9 days (2003; 250 beds)
  - Compliance or adherence means running pumps in alert mode, an important measure of ‘performance’ linked to fewer IV ADEs
  - Also important are ratios such as reprograms/total infusions and overrides/total infusions
    - Not unusual to override 80-90% of alerts
## Cost of IV ADEs

<table>
<thead>
<tr>
<th>Year Published</th>
<th>Cost Per Event (based on avg # additional inpatient days)</th>
<th>Annual Cost</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>$5,857</td>
<td>$2.8 Million for 700-bed hospital system</td>
<td>Bates, Spell, Cullen, et al. -Cited, even today!</td>
</tr>
<tr>
<td>2000</td>
<td>---</td>
<td>$2 Billion for entire US healthcare system</td>
<td>Institute of Medicine (IOM)</td>
</tr>
<tr>
<td>2009</td>
<td>---</td>
<td>$3.5 Billion for entire US healthcare system</td>
<td>Howard</td>
</tr>
<tr>
<td>2010</td>
<td>$8,750 (2006)</td>
<td>---</td>
<td>Breland</td>
</tr>
</tbody>
</table>
## Reported Alert Ratios

<table>
<thead>
<tr>
<th>Year</th>
<th>Overrides/Total Infusions</th>
<th>Reprograms/Total Infusions</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>4.5-5.2%</td>
<td>0.72-1.74%</td>
<td>Malashock, et al.</td>
</tr>
<tr>
<td>2006</td>
<td>---</td>
<td>0.3%</td>
<td>Cassano</td>
</tr>
<tr>
<td>2010</td>
<td>5-15%</td>
<td>0.4-1.2%</td>
<td>Breland</td>
</tr>
</tbody>
</table>
Investigating Heparin

Heparin Alerts in 2010

- CHN: 2252
- St F: 580
- Wisc: 1021
- Wishard: 379

Total: 3754
Investigating Heparin

Average Number of Devices in 2010

- CHN: 480.5
- St F: 509.9
- Wisc: 391
- Wishard: 265.6
Investigating Heparin

- Heparin Min

Note: UW-Madison was excluded because the concentration uses differs from the other institutions; therefore limits are not comparable.
Investigating Heparin

Heparin Soft Limit Maximum

- CHN
- SF
- Wish
Investigating Heparin

Heparin Alerts by Max/Min

- CHN: 1311 Alerts
  - Below Minimum Limit: 712 Alerts
  - Above Maximum Limit: 603 Alerts
- StF: 473 Alerts
- UW: 640 Alerts
- Wish: 229 Alerts

Legend:
- Yellow: Below Minimum Limit
- Blue: Above Maximum Limit
Investigating Heparin

Overrides to Total Alerts for Heparin in 2010

<table>
<thead>
<tr>
<th>Hospital</th>
<th>% Overrides</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHN</td>
<td>82.8</td>
</tr>
<tr>
<td>St F</td>
<td>73.8</td>
</tr>
<tr>
<td>Wisc</td>
<td>76.6</td>
</tr>
<tr>
<td>Wishard</td>
<td>66.8</td>
</tr>
</tbody>
</table>
Future Directions?

- Some questions cannot be answered with data alone, we need input from users
- For some we need pharmacist expertise (e.g. concentrations, dose types)
- Look for questions in the discussions section of IPI
Request for Interviews

- Goal 1: To document IPI user experiences by producing case studies
- Goal 2: To help us find more direction with the research questions
Contents

- IPI tool usage
  - Most common charts
- Results of literature review
  - Cost of IV ADEs
  - Other comparative statistics
- Example research investigation: Heparin
- Follow up: Invitation for hospital interviews
  - To help set research direction
  - To gather case studies
IPI Usage: Analysis Charts

IPI Analyses Viewed

- 29 Alerts Profile Pie Chart
- 21 Alerts by Month
- 16 Alerts by Time of Day
- 10 Alerts by Month by Resolution
- 10 Actions Taken by Drug or Fluid
- 8 Alerts by D/F
- 6 Alerts by Alert Types by Month
- 3 Alerts by Month Line Graph
- 1 Alerts by Time of Day by Resolution
- 1 Alerts by Month by Profile
IPI Usage: Comparison Charts

IPI Comparisons Viewed

- Actions by D/F: 31
- Alerts By Alert Type by Month: 15
- Alerts by D/F: 8
- Alerts by Month: 5
- Alerts by Time of Day: 8
- Alerts Profile Pie Chart: 14
- Alerts by Type Pie Chart: 6
Literature Search

- For your reference: bibliography in your packet

**Facts:**

- ADEs with IV Drugs are 35 to 54 percent of all ADEs (2000, 2004)
- Smart pumps avert serious ADEs every 2.6 days, and a moderate to significant event every 1.9 days (2003; 250 beds)
- Compliance or adherence means running pumps in alert mode, an important measure of ‘performance’ linked to fewer IV ADEs
- Also important are ratios such as reprograms/total infusions and overrides/total infusions
  - Not unusual to override 80-90% of alerts
## Cost of IV ADEs

<table>
<thead>
<tr>
<th>Year Published</th>
<th>Cost Per Event (based on avg # additional inpatient days)</th>
<th>Annual Cost</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>$5,857</td>
<td>$2.8 Million for 700-bed hospital system</td>
<td>Bates, Spell, Cullen, et al. -Cited, even today!</td>
</tr>
<tr>
<td>2000</td>
<td>---</td>
<td>$2 Billion for entire US healthcare system</td>
<td>Institute of Medicine (IOM)</td>
</tr>
<tr>
<td>2009</td>
<td>---</td>
<td>$3.5 Billion for entire US healthcare system</td>
<td>Howard</td>
</tr>
<tr>
<td>2010</td>
<td>$8,750 (2006)</td>
<td>---</td>
<td>Breland</td>
</tr>
</tbody>
</table>
# Reported Alert Ratios

<table>
<thead>
<tr>
<th>Year</th>
<th>Overrides/Total Infusions</th>
<th>Reprograms/Total Infusions</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>4.5-5.2%</td>
<td>0.72-1.74%</td>
<td>Malashock, et al.</td>
</tr>
<tr>
<td>2006</td>
<td>---</td>
<td>0.3%</td>
<td>Cassano</td>
</tr>
<tr>
<td>2010</td>
<td>5-15%</td>
<td>0.4-1.2%</td>
<td>Breland</td>
</tr>
</tbody>
</table>
Investigating Heparin

Heparin Alerts in 2010

- CHN: 2252
- St F: 580
- Wisc: 1021
- Wishard: 379
Investigating Heparin

Average Number of Devices in 2010

- CHN: 480.5
- St F: 509.9
- Wisc: 391
- Wishard: 265.6
Investigating Heparin

- Heparin Min

Note: UW-Madison was excluded because the concentration uses differs from the other institutions; therefore limits are not comparable.
Investigating Heparin

Heparin Soft Limit Maximum

Dose (Conc: 25,000units/250mL)

- CHN
- SF
- Wish
Investigating Heparin

Heparin Alerts by Max/Min

- CHN: 1311 (1179 below, 32 above)
- StF: 473 (34 below, 139 above)
- UW: 640 (187 below, 453 above)
- Wish: 229 (203 below, 26 above)

The graph shows the number of alerts for each hospital, with bars indicating alerts below and above maximum limits.
Investigating Heparin

Overrides to Total Alerts for Heparin in 2010

<table>
<thead>
<tr>
<th>Hospital</th>
<th>% Overrides</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHN</td>
<td>82.8</td>
</tr>
<tr>
<td>St F</td>
<td>73.8</td>
</tr>
<tr>
<td>Wisc</td>
<td>76.6</td>
</tr>
<tr>
<td>Wishard</td>
<td>66.8</td>
</tr>
</tbody>
</table>
Future Directions?

- Some questions cannot be answered with data alone, we need input from users.
- For some we need pharmacist expertise (e.g. concentrations, dose types).
- Look for questions in the discussions section of IPI.
Request for Interviews

- Goal 1: To document IPI user experiences by producing case studies
- Goal 2: To help us find more direction with the research questions
Contents

- IPI tool usage
  - Most common charts
- Results of literature review
  - Cost of IV ADEs
  - Other comparative statistics
- Example research investigation: Heparin
- Follow up: Invitation for hospital interviews
  - To help set research direction
  - To gather case studies
IPI Usage: Analysis Charts

IPI Analyses Viewed

- Alerts Profile Pie Chart: 29
- Alerts by Month: 21
- Alerts by Time of Day: 21
- Alerts by Month by Resolution: 16
- Actions Taken by Drug or Fluid: 10
- Alerts by D/F: 10
- Alerts by Alert Types by Month: 8
- Alerts by Month Line Graph: 3
- Alerts by Time of Day by Resolution: 1
- Alerts by Month by Profile: 1
IPI Usage: Comparison Charts

IPI Comparisons Viewed

- Actions by D/F: 31
- Alerts By Alert Type by Month: 8
- Alerts by D/F: 15
- Alerts by Month: 5
- Alerts by Time of Day: 8
- Alerts Profile Pie Chart: 14
- Alerts by Type Pie Chart: 6
Literature Search

• For your reference: bibliography in your packet

• Facts:
  • ADEs with IV Drugs are 35 to 54 percent of all ADEs (2000, 2004)
  • Smart pumps avert serious ADEs every 2.6 days, and a moderate to significant event every 1.9 days (2003; 250 beds)
  • Compliance or adherence means running pumps in alert mode, an important measure of ‘performance’ linked to fewer IV ADEs
  • Also important are ratios such as reprograms/total infusions and overrides/total infusions
    • Not unusual to override 80-90% of alerts
## Cost of IV ADEs

<table>
<thead>
<tr>
<th>Year Published</th>
<th>Cost Per Event (based on avg # additional inpatient days)</th>
<th>Annual Cost</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>$5,857</td>
<td>$2.8 Million for 700-bed hospital system</td>
<td>Bates, Spell, Cullen, et al. -Cited, even today!</td>
</tr>
<tr>
<td>2000</td>
<td>---</td>
<td>$2 Billion for entire US healthcare system</td>
<td>Institute of Medicine (IOM)</td>
</tr>
<tr>
<td>2009</td>
<td>---</td>
<td>$3.5 Billion for entire US healthcare system</td>
<td>Howard</td>
</tr>
<tr>
<td>2010</td>
<td>$8,750 (2006)</td>
<td>---</td>
<td>Brelan</td>
</tr>
</tbody>
</table>
## Reported Alert Ratios

<table>
<thead>
<tr>
<th>Year</th>
<th>Overrides/Total Infusions</th>
<th>Reprograms/Total Infusions</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>4.5-5.2%</td>
<td>0.72-1.74%</td>
<td>Malashock, et al.</td>
</tr>
<tr>
<td>2006</td>
<td>---</td>
<td>0.3%</td>
<td>Cassano</td>
</tr>
<tr>
<td>2010</td>
<td>5-15%</td>
<td>0.4-1.2%</td>
<td>Breland</td>
</tr>
</tbody>
</table>
Investigating Heparin

Heparin Alerts in 2010

- CHN: 379
- St F: 580
- Wisc: 1021
- Wishard: 2252
Investigating Heparin

**Average Number of Devices in 2010**

- CHN: 265.6
- St F: 509.9
- Wisc: 480.5
- Wishard: 391
Investigating Heparin

- Heparin Min

Note: UW-Madison was excluded because the concentration uses differs from the other institutions; therefore limits are not comparable.
Investigating Heparin

Heparin Soft Limit Maximum

- CHN
- SF
- Wish

Dose (Conc: 25,000 units/250 mL)

- 2008
- 2009
- 2010
- 2011
Investigating Heparin

Heparin Alerts by Max/Min

- CHN: 1311 (Below Minimum Limit: 712, Above Maximum Limit: 609)
- StF: 473 (Below Minimum Limit: 34, Above Maximum Limit: 439)
- UW: 640 (Below Minimum Limit: 187, Above Maximum Limit: 453)
- Wish: 229 (Below Minimum Limit: 203, Above Maximum Limit: 26)
Investigating Heparin

Overrides to Total Alerts for Heparin in 2010

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Overrides</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHN</td>
<td>82.8</td>
</tr>
<tr>
<td>St F</td>
<td>73.8</td>
</tr>
<tr>
<td>Wisc</td>
<td>76.6</td>
</tr>
<tr>
<td>Wishard</td>
<td>66.8</td>
</tr>
</tbody>
</table>
Future Directions?

- Some questions cannot be answered with data alone, we need input from users.
- For some we need pharmacist expertise (e.g. concentrations, dose types).
- Look for questions in the discussions section of IPI.
Request for Interviews

- Goal 1: To document IPI user experiences by producing case studies
- Goal 2: To help us find more direction with the research questions