Safe Medication Practices

Patient Safety:
Preventing Adverse Events
OHA Conference

Renaissance Toronto Hotel at SkyDome
Toronto
June 14, 2004

David U
President & CEO, ISMP Canada
Agenda

- ISMP Canada
- Patient Safety Studies in Canada
- Identified Medication related Issues
- Success Stories on Medication Safety
- Proposed Safety Strategies
- Medication Safety Tools
- Where do We Go from Here
ISMP Recent Projects

- CMIRPS partner
- Systems Analysis of Medication Errors (SAME)
- Ontario medication error database
- Safe Medication Support Service
  - Potassium Chloride
  - Opiate Narcotics
- Infusion Pump Survey
- CH-FMEA workshop
Canadian Study (results)

- 289 AEs from 3745 charts
- 7.5% AE (1 in 13 hospitalizations)
- 37% preventable
- App. 34% involved surgical events
- App. 24% involved drugs and fluids
Canadian Study (Interpretation)

- 185,000 AEs
- 70,000 preventable
- 43,200 AEs related to Drugs/Fluids
- > 10,000 preventable ADEs
- Between 9,250 to 23,750 deaths from AEs in Canadian hospitals
Research Highlights

Boston hospitals 1997 (Bates et al)

- additional length of stay for preventable ADE = 4.6 days
- increase in cost for preventable ADE = $5857
- cost for preventable ADE in 700-bed teaching hospital = $2.8 million
Relationship Between Med Errors and ADEs

In a 200 bed facility:

<table>
<thead>
<tr>
<th>Doses</th>
<th>Errors</th>
<th>ADEs</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,000</td>
<td>200</td>
<td>2 per day!</td>
</tr>
</tbody>
</table>

Relationship of Medication Errors to ADEs

Bates study using chart-review-plus-self-report method detected 1 ADE per 100 errors.

Canadian Collaboratives

- CMIRPS
- CCHSA
- OHA
- Provincial
  - Ontario
  - Manitoba
  - Saskatchewan
  - Nova Scotia
  - British Columbia
  - Alberta
Adverse Study on Discharged Patients

- Adverse events among medical patients after discharge from hospital by Alan Forster

- 328 patients: 76 experienced AE (23%)

- Most common AEs are ADEs (72%)
Incidence and Severity of Adverse Events After Discharge

- 400 medical inpatients
- Adverse event rate 19%
  - 6% preventable
    - 48% of ADEs resulting in at least non-permanent disability preventable
  - 6% ameliorable
- Of adverse events
  - 66% were ADEs
  - 17% procedure-related

Pre-hospitalized AE Study (Forster)

- 502 adult patients in Ottawa Hospital
- 64 adverse events (12.7%)
- One third deemed preventable
- Most events due to Drug Treatment
- 25 after admission; 39 pre-hospitalized
- Safety must be addressed in ambulatory care front
ISMP Canada
Ontario Medication Error Study

- A descriptive Study on Analysis of Medication Errors from a sample of Ontario hospitals using a standardized data collection approach of a software program (Analyze-ERR)

- Make limited comparison with studies of medication error and Adverse Drug Events in the US.
ISMP Canada
Ontario Medication Error Study

- Ontario MOHLTC funded study
- Voluntary Reporting via the Analyze-ERR software program
- Data on errors/near misses and causes
- 14 hospitals in Ontario / 12 months data collection
- Over 4,200 error events reported
Ontario Medication Error Study (continued)

- Type of error
- Outcome description
- Severity Code
- Drug’s therapeutic classification
- Stages when error occurs
- Time of the day of error
- Age and gender of patient
- Program/service where error occur
Why Medication Safety?

- One of the leading causes of adverse events in many studies
- High visibility and high cost
- Many key technology, information management, and error prevention strategies are already developed
Most Frequent Serious Error Types

- Insulin
- Free flow IV pumps
- PCA devices
- Parenteral narcotics
- Lidocaine
- Cancer chemotherapy
- Neuromuscular blockers
- Conscious sedation
- Concentrated electrolytes (potassium, magnesium, phosphate)
Key Medication Use Issues

- High Alert Drugs (concentrated electrolytes; narcotics; anti-coagulants; insulin)
- Infusion Pumps
- Clinical Judgement
- Product Issues (Labels; Packaging)
Rank Order of Error Reduction Strategies

- Forcing functions and constraints
- Automation and computerization
- Simplify and standardize
- Reminders, check lists and double check systems
- Rules and policies
- Education
- Information
- Punishment (no value)
Primary Principles in Error Reduction

- Reduce or Eliminate the Possibility of Errors
  - Failure mode analysis
  - Root cause analysis
  - System redesign (HFE principles)

- Make Errors Visible
  - Computer alerts
  - Warnings/reminders
  - Double check systems
  - Triggers (markers)
Three ways to improve safety

- Safety for Dummies
- Increase Detectability
- Decrease Frequency of Occurrence
- Reduce Severity
Safety Strategies

- Implement Best Practices on High Alert Drugs
- Develop Best Practices dealing with Infusion Pumps
- Deploy Clinical Pharmacists
- Continuum of Care (communication)
- Proactive Risk Assessment Tool
- Technology
ISMP Canada Medication Safety Support Service
Potassium Chloride Concentrate Follow Up Survey

Use of Pre-mixed KCl Solutions and Standardization in Ontario Hospital Sites

- **Buy Premix**: 73% in Nov. 2002 Survey (n=135), 86% in Jul. 2003 Survey (n=104)
- **Make Premix**: 24% in Nov. 2002 Survey (n=135), 42% in Jul. 2003 Survey (n=104)
- **Standards**: 38% in Nov. 2002 Survey (n=135), 57% in Jul. 2003 Survey (n=104)
- **Guidelines**: 71% in Nov. 2002 Survey (n=135), 71% in Jul. 2003 Survey (n=104)
- **Autosubstitution**: 21% in Nov. 2002 Survey (n=135), 43% in Jul. 2003 Survey (n=104)
Other Potassium Issues

- Storage of conc. KCl in special areas
  - ICU
  - OR/ER
  - Pediatrics/Neonates
  - Pharmacy
- Other concentrate Potassium salts
  - Potassium phosphate
  - Potassium Acetate
Narcotic Medication Safety Initiative

- Storage and Labeling
  - Restricting the storage of high potency narcotics
  - Developing process/system alerting staff with similar names
    - Morphine vs Hydromorphone
    - Hydromorphone vs Hydromorp Contin
    - Oxy-IR vs Oxy-Contin
    - Fentanyl vs Sufentanyl
Narcotic Medication Safety Initiative

- Standardization
  - Limiting choice of concentration
  - Restricting use of Meperidine
Narcotic Medication Safety Initiative

- Patient Controlled Analgesia (PCA) and Epidural Narcotics
  - Establishing patient selection criteria
  - Using specialty, coloured tubing to differentiate epidural from IV tubing
Narcotic Medication Safety Initiative

- Independent Double Checks
  - Developing documentation process for selected independent double-checks
Independent Checking: Does it work?

- Two practitioners going through the same calculation or reading the same labels not exactly “independent”
- System induced errors hard to check
- Need proper training
- Double check on high alert drugs
- Double check on high risk patients
ISMP Canada Infusion Pump Safety Project
Pump Problems Encountered

<table>
<thead>
<tr>
<th>Response</th>
<th>Total Aggregate (n=340)</th>
<th>Ontario Responses (n=98)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>85</td>
<td>25</td>
</tr>
<tr>
<td>Yes</td>
<td>255</td>
<td>73</td>
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</table>
ISMP Canada Infusion Pump Safety Project
Pump Problems Reported

<table>
<thead>
<tr>
<th>Major Problem Types</th>
<th>Number of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free Flow</td>
<td>160</td>
</tr>
<tr>
<td>Flow Rate</td>
<td>197</td>
</tr>
<tr>
<td>Over Dose</td>
<td>121</td>
</tr>
<tr>
<td>Air Sensor</td>
<td>161</td>
</tr>
<tr>
<td>Other</td>
<td>78</td>
</tr>
</tbody>
</table>

- **Ontario Responses (n=98)**: 42, 57, 38, 43, 28
Warning Notice from HC on Infusion pumps

- Reports received between 1987-2003
  - 425 Incidents
  - 135 injuries
  - 23 deaths
  - 127 potential deaths or injuries
Warning Notice from HC on Infusion pumps

- Key Recommendations:
  - Adequate training
  - Free flow protection
  - Ergonomics
  - Programming safeguards (smart pumps)
  - Criteria and education on PCA use
What is next?

- Infusion Pump a National Concern: Needs a National Strategy
- Strategies on infusion pump end-user side
- Recommendations to manufacturers
- Health Canada’s role on monitoring
- A Collaborative from key stakeholders
- Needs Support and Resources
- CPSI taking the lead and coordination
Computerized Physician Order Entry

- Single most powerful intervention for improving medication safety to date
- Over 80% reduction in medication error rate
- Need to have associated decision support if want to see high level of benefit
Bar-coding

- Technology is inexpensive
- Would help in:
  - Matching medication orders and drug products
  - Medications dispensed/administered
  - Identifying correct patient
- Will know
  - What/how much/who/when
- Few published data so far, but experience in other industries suggest important benefit
Impact of “Smart” IV Pumps

- Few administration errors get caught
  - Yet intravenous errors can be especially dangerous

*Case*

- Heparin bolus dose of 4000 units, followed by an infusion of 890 units/hr
  - 4000 unit bolus dose was given appropriately
  - But nurse misinterpreted the order and programmed the infusion device to deliver 4000 U/hour, not 890 U/hour

- Smart pump alerted nurse

- Early data—2 such errors/day in 400-bed hospital

*ISMP Newsletter Feb 6, 2002*
Accurate Administering

*Automated bedside verification*

- Provides legible on-line MAR
  - Enhances care team communications
  - Comprehensive charting for enhanced billing
Bar-code and Medication Administration

- 71% decrease in medication error rate over 2 years
- 33% decrease in wrong drug
- 52% decrease in omitted doses

Puckett, F. Am J Health-Sys Pharm, 1995
Human Factors Engineering 101

HFE: a discipline concerned with design of systems, tools, processes, machines that take into account human capabilities, limitations, and characteristics

HFE = Ergonomics = usability
engineering = user centered design
Human Factors Engineering (HFE)

- Medical devices such as infusion pumps
- Computer software design
- Point of care dispensing cabinets
- Labeling and packaging of pharmaceuticals
- Distribution system
- Protocols/Policies and Procedures
FMEA definition

- FMEA is a team-based systematic and proactive approach for identifying the ways that a process or design can fail, why it might fail, the effects of that failure and how it can be made safer.

- FMEA focuses on how and when a system will fail, not IF it will fail.
Why FMEA?

- It’s a “brain flip” for health care – bringing analysis logic into the hospital
- Takes a proactive approach and reduces the gaps in quality and safety
- Don’t have to wait until a patient dies, or is injured to make system fixes
- Makes systems more “robust” and enhances performance
- Makes systems more “fault tolerant”
- Focuses on systems, not individuals
FMEA versus RCA (when to use)

- Proactive look at designing a new system or process
- When processes are changed
- High Risk processes
- Complex processes
- Interdisciplinary processes with hand offs and interdependent steps
FMEA versus RCA (when to use)

- **FMEA** = Future (preventative)
- **RCA** = Retrospective (after the event or close call)
Where do We go from Here?

- Continue working on high-risk Potassium products
- Develop best practices for opiate narcotics
- Work on CMIRPS development
- Ontario medication error database with annual report
- Expand implementation of Medication Safety Self Assessment
- Implement workshops on HFE and CH-FMEA
www.ismp-canada.org