Agenda

- ISMP Canada’s vision, mission and programs
- How safe is our healthcare system?
- Needs Cultural changes
- Pharmacy related errors/issues
- Pharmacy Technicians’ role
- Human Factors Engineering and Environmental Factors
- Regulated Pharmacy Technician issues
ISMP Canada Vision

- Independent nonprofit organization
- Established for the collection & analysis of medication error reports and the development of recommendations for the enhancement of patient safety
- Intends to serve as a national resource for promoting safe medication practices throughout the healthcare community in Canada
Mission

Committed to the safe use of medication through improvement in drug distribution, naming, packaging, labeling, computer program design and drug delivery system design.

Collaborate with healthcare practitioners and institutions, schools, professional organizations, pharmaceutical industry and regulatory & government agencies to provide education about adverse drug events and their prevention.
Voluntary Practitioner Error Reporting System

- A voluntary, non-punitive reporting stimulates participation in reporting programs
- Front-line practitioners provide detailed, unrestricted information on incidents
- Errors, near-misses and hazardous situations
- Provides expert analysis, disseminates high-leverage safety strategies effectively
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
Programs

- Medication errors and near-misses reports
- Analysis and Recommendation for prevention strategies
- Publication and distribution of Medication Safety Alert Newsletters
- Application of the Analyze-Err program
- Application of the Medication Safety Self Assessment (A QA tool)
Canadian Collaboratives

- CMIRPS
- CCHSA
- CPSI
- Provincial
  - Ontario
  - Manitoba
  - Saskatchewan
  - Nova Scotia
  - British Columbia
  - Alberta
Medication Safety Alerts Newsletters

- Monthly newsletters on safe medication practices and special alerts
- Format similar to ISMP Medication Safety Alert! newsletters
- Distributed to healthcare institutions, community practice, practitioners and professional organizations
- By subscription
Medication Safety Self Assessment (Community version)

- Developed by ISMP
- Implemented by over 1300 hospitals in US
- Derived from years of experience from analysis of medication errors reported
- Adapted to Canadian version
- Ready to be launched in Canadian hospitals
How Safe Is Health Care?

- Harvard Medical Practice Study found adverse events occurred in 3.7% of hospitalizations;
- Australian study found 16.6% of hospital admissions were associated with an adverse event – 5% of these patients died
- IOM Report in US estimates 44,000 to 98,000 deaths yearly due to error
## Incidence From Other Chart Review Studies

<table>
<thead>
<tr>
<th>Country</th>
<th>N Charts</th>
<th>Year</th>
<th>Incidence of AE</th>
<th>Preventable?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>14,000</td>
<td>1995</td>
<td>16.6%</td>
<td>51%</td>
</tr>
<tr>
<td>USA (Utah &amp; Colorado)</td>
<td>15,000</td>
<td>2000</td>
<td>2.9%</td>
<td>--</td>
</tr>
<tr>
<td>England</td>
<td>1014</td>
<td>2001</td>
<td>11.7%</td>
<td>50%</td>
</tr>
<tr>
<td>New Zealand</td>
<td>1326</td>
<td>2001</td>
<td>10.7%</td>
<td>71.8%</td>
</tr>
<tr>
<td>Denmark</td>
<td>1097</td>
<td>2001</td>
<td>9.0%</td>
<td>40.4%</td>
</tr>
</tbody>
</table>
Canadian Study

- CIHI and CIHR joint Study
- Retrospective chart review study on ADEs
- Applying the Australian study using predefined triggers
- Hospitals in 5 provinces
- Results published on May 25, 2004
The Canadian Study

**Study Goals**

- To identify the incidence of adverse events in a sample of Canadian hospitals
- To compare the incidence between medical and surgical patients and between different types of hospitals
- To compare the incidence to results from similar studies in England, Australia, New Zealand and elsewhere
- To compare results from chart based review obtained from administrative data and hospital incident reporting systems
Canadian Adverse Events Study

Based on methods used in the Harvard Medical Practice Study

These methods have been further developed in studies in the Australia and UK

Uses chart reviews of hospital records to identify adverse events and assess whether these events might be prevented
Canadian Study (results)

- 7.5% AE (1 in 13 hospitalizations)
- 37% preventable
- App. 45% involved surgical events
- App. 25% involved drugs and fluids
Why Medication Safety?

- One of the leading causes of adverse events in many studies
- High visibility and high cost
- Many key technology and information management strategies are already developed
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
Annual Projections per Hospital (US data)

- 6,000,000 medication orders
- 300,000 medication errors
- 1900 ADEs
  - 530 preventable ADEs
  - 1370 non-preventable ADEs
- 1600 potential ADEs
Another Canadian Study

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

- Ontario MOHLTC funded study
- Prospective medication errors tracking
- Analyze-ERR software program
- Data on errors/near misses and root causes
- 14 hospitals in Ontario / 12 months data collection
- Over 4,600 records
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
Relationships Between Med Errors, Potential ADEs, and ADEs

- Medication Errors
- Pot ADEs
- Preventable ADEs
- Non-Preventable ADEs (ADRs)
Error Stage for Preventable ADEs and PADEs (n=264)

- Ordering: 49%
- Admin: 26%
- Transcrip: 11%
- Dispensing: 14%
Error investigations always concentrate on the *sharp end* (front line staff) where patient/caregiver interaction occurs.

Contributing factors and latent errors often originate at the *blunt end* where organizational policies, procedures, and resource allocation decisions are made.
Latent (Blunt End) Failures

- Incomplete information about the patient
- Unclear communication of drug order
- Lack of unit dose system
- Lack of independent check before dispensing
- Lack of computer warning about excessive dose
- Ambiguous drug references
- Conflicting requirements for staff competency to prescribe
- Warning not placed prominently on syringe
Culture Change

- Provide leadership
- Job design: avoid reliance on memory, simplification and standardization (dispel the belief that healthcare workers are perfect)
- Promote effective team functioning
- Anticipate the unexpected; design for recovery
- Create a learning environment
- Dispel the fear of litigation and discovery
Shared Accountability – Sharp End

Error detection and reporting
- Seek out errors and voluntarily report them
- Speak out about patient safety issues
- Share personal knowledge of what went wrong
- Recommend error reduction strategies

Error reduction efforts
- Facilitate implementation of system-based error reduction strategies
Shared Accountability – Sharp End

Safe professional practice habits
- Follow the safety literature
- Seek out education to maintain competencies
- Willingness to change practices
- Ask for help when needed
- Value teamwork
- Support colleagues
Shared Accountability – Blunt End

- Position patient safety as job one
- Promote and reward error detection and reporting
- Communicate directly with staff
  - Safety enhancements
  - Discuss mission, vision, values, strategic goals
  - Learn about the barriers to safe practice
Shared Accountability – Blunt End

- Establish safe workloads
- Support system enhancements as recommended by front-line
- Lead proactive improvement efforts
- Require periodic self assessment of safety
- Engage the community in patient safety
Medication Errors – A New Way of Thinking

<table>
<thead>
<tr>
<th>FROM:</th>
<th>TO:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who did it?</td>
<td>What allowed it?</td>
</tr>
<tr>
<td>Punishment</td>
<td>Thank you!</td>
</tr>
<tr>
<td>Errors are rare</td>
<td>Errors are everywhere</td>
</tr>
<tr>
<td>Physicians don’t</td>
<td>Physicians, RNs, RPh, QA/ RM</td>
</tr>
<tr>
<td>participate</td>
<td>involved</td>
</tr>
<tr>
<td>Add more layers</td>
<td>Simplify/standardize</td>
</tr>
<tr>
<td>Calculating error</td>
<td>No thresholds</td>
</tr>
<tr>
<td>rates</td>
<td></td>
</tr>
</tbody>
</table>
Emphasis on Multi-factorial Nature of Errors

- Assume that slips, lapses and mistakes are inevitable
- Many factors, latent and active, must be present and in proper alignment for error to occur
- Emphasis on redesign of system to make it more difficult to err
Errors Involved in Dispensing Stage

- Wrong patient
- Wrong drug(s)
- Wrong dose
- Wrong route
- Wrong frequency
- Missing drug/dose
- Drugs given without an order
- Incorrect labeling
Opportunities for Mishaps

- Prepackaging
- Manual unit dose filling
- Point of Care dispensing cabinets
- Robot and ATC dispensing
- Floor stock
- I.V. Admixture/TPN
- Chemotherapy preparation
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)
Changes Needed to Improve Medication Use Process

- Computerization of medication use process
- Use of machine readable codes for most administered medications
- More consumer involvement in medication safety
- Improved access to drug information, error alerts in monographs, electronic reminders
Primary Principles in Error Reduction

- **Reduce or Eliminate the Possibility of Errors**
  - Failure mode analysis
  - Root cause analysis
  - System redesign

- **Make Errors Visible**
  - Computer alerts
  - Warnings/reminders
  - Double check systems
  - Triggers (markers)
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)
High Alert Medications

- Adrenergic agonists
- Intravenous adrenergic antagonists
- Amiodarone & amrinone
- Benzodiazepines (primarily midazolam)
- Intravenous calcium
- Chemotherapeutic agents
- Chloral hydrate liquid in pediatrics
- Intravenous digoxin
- Dopamine & dobutamine
- Heparin (intravenous) and warfarin
- Insulin
- Lidocaine
- Intravenous magnesium sulfate
- Opiate narcotics
- Neuromuscular blocking agents
- Intravenous potassium phosphate & potassium chloride
- Intravenous sodium chloride, high concentrations
- Theophylline
Gu Regular Insulin Now

Synthroid 0.1 mg P.O.
Dox 0.125 mg P.O. gid
Minipress 5 mg P.O. gid
Foley catheter

Urine test for each meal + no. 25 mg @ Hs.
Hydroures 25 mg gid + t.d.s.
Tsera Sequal 300 + Capsule
Pkg
Urinalysis
US 45 NS 75 cc/hr, add 25 meq KCl after patient voids.

Bicillin 600,000 IU IM x 1 dose
Zerdil 20mg $ 120
20mg P.O. 0.86ml
Zytniu 10.189^2 \div \sqrt{5}
Haldal Singh #270

T AM, IT HS
Linceton 10y # 90

69 - 79 0
<table>
<thead>
<tr>
<th>20k - 300</th>
<th>2011</th>
<th>PPIX S1D</th>
</tr>
</thead>
<tbody>
<tr>
<td>301 - 450</td>
<td>400</td>
<td>P114 S1C</td>
</tr>
<tr>
<td>451 - 7400</td>
<td>Call on</td>
<td></td>
</tr>
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</table>
Chloral hydrate
500 mg
P.O. 3x before retiring
yy Rey
Safe Practice Recommendations for Automated Dispensing Units

- Minimize drug supply and stock drugs in unit dose, smallest dose/container size, single concentration.
- Establish maximum dose range for “high alert” medications.
- Educate staff to remove single selected dose only.
- Returns to pharmacy, not dispensing unit.
- Adequate check system to assure accurate restocking.
- Allergy reminders for specific drugs on appropriate storage pockets or drawers.
Drug Labeling, Packaging and Nomenclature

- Unclear manufacturer labeling and packaging
- Similar drug names, packaging or labeling
- Unlabeled syringes prepared by staff
- Computer-generated labels difficult to read
Drug Storage, Stock and Distribution

- Consistent brands/strengths
- Bins and stock organization
- Returned medication
- Expired medication
- Unit dose packaging and dispensing
- Traditional dispensing and wardstock
- Chemotherapy preparation
- I.V. admixture
Enalaprilat Injection 1.25 mg/mL Anhydrous Equivalent FOR INTRAMUSCULAR USE ONLY

Pancuronium Bromide Injection 2 mg/mL Rx only
Confirmation Bias

It leads one to “see” information that confirms our expectation rather than to see information that contradict our expectation.
The power of the human mind

According to a research at Cambridge University, it doesn't matter in what order the letters in a word are. The only important thing is that the first and last letter be at the right place. The rest can be a total mess and you can still read it without problem. This is because the human mind does not read every letter by itself, but the word as a whole.

Amazing huh?
Pharmacy Technicians’ Key Roles

- Participate in Safe Medication Practice Committee
- Open communication with colleagues
- Be vigilant on questionable orders
- Be alert on high risk drugs:
  - purchase
  - labeling
  - dispensing
Pharmacy Technicians’ Key Roles

- Update on new technologies
  - bar-coding
  - point-of-care dispensing cabinet
  - wireless hand-held scanner
  - Robot/ATC
  - COPE and Pharmacy computer system
Emerging Issues

- New Treatments
- New Drugs
- New Technologies
- Privacy Issues
- Patient Safety
- Changing roles
Challenges and Barriers

- Political and economic factors
- Education to keep up
- Certification principle and practice
- Patient/clients centre care
- Increasing workload
Staff Competency & Education

- Competency validation
- Certification process
- Staff development
- New and unfamiliar drugs
- Orientation process
- Asking questions and challenging pharmacist
Environmental Factors

- Workload issue
- Staff morale issue
- Air circulation, lighting, noise and space
- Workflow
- Interruptions
- Employee safety
Quality Processes & Risk Management

- QA audit on unit dose bin fill
- QA audit on i.v. admixture
- Perform independent checks
- High risk drugs and high risk patient population
Independent Checking

- Keep prescription, label, and medication container together
- Verify prescriptions prepared by technicians
- Calculations
- Standard concentrations
- Automated compounding equipment

Davis NM. *American Pharmacy* 1994; NS 34: 22-23.
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
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 - Guiding Principle

Fit the task or tool to the human, not the other way around
Goals of Process Design

- Minimize additional work/tasks
- Provide relevant info needed to get job done
- Provide suitable work area to get job done
Goals of **Tool** Design

- Simple, concise, natural language & familiar terms
- Logical layout of info
- Located close to where task is carried out (minimize working memory)
- Easily identifiable as reference (should not require reading)
- Provides enough info and detail for new user
- Provides “quick” shortcuts for familiar users
Some Human Factors Themes...

- **Working Memory / Workload / Task Demands**
  - time pressure, cognitive demands, stress, information overload, multi-tasking
- **Task Flow / Information flow**
- **Confirmation Bias or Cognitive Tunnel Vision**
- **Repetition, Fatigue, Sleep Deprivation**
- **Interface Design** (order forms, drug packages & labels, etc.)
- **High Noise-to-Signal Ratio** (information overload)
- **Work Area Design & Environmental Factors** (lighting, noise, distractions)
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
Environmental Factors

- Work pace
- Illumination
- Noise,
- Interruptions
- Staffing
Organization Dynamics

- Cultural issues
- Supervisory practices
- Organization support
Personal Qualities

- Demeanor
- Patience
- Ability to manage stress
- Interpersonal relationship
What is Happening in Alberta

- Interests expressed in part of regulated health professional
- A need for
  - Defining standards of practice
  - Introducing code of Ethics
  - Ensuring competency