Safe Medication Practices

Patient Safety:
Preventing Adverse Events
OHA Conference

Renaissance Toronto Hotel at SkyDome
Toronto
June 14, 2004

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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

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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

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Relationship Between Med Errors and ADEs

In a 200 bed facility:

Doses		Errors		ADEs
2,000	=	200	=	2 per day!

Slide from the presentation on Analysis of Medication Errors in 36 Hospitals and SNFs, by Kenneth N. Barker, et al at ASHP Midyear Clinical Meeting, 2002.

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Relationship of Medication Errors to ADEs

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

Bates DW, et al. Relationship between medication errors and adverse drug events. J. Gen Intern Med 10:199-205, 1995

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Canadian Collaboratives

- CMIRPS
- CCHSA
- OHA
- Provincial
  - Ontario
  - Manitoba
  - Saskatchewan
  - Nova Scotia
  - British Columbia
  - Alberta

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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

Forster et al, Ann Intern Med, 2003

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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

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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.

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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

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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)

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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

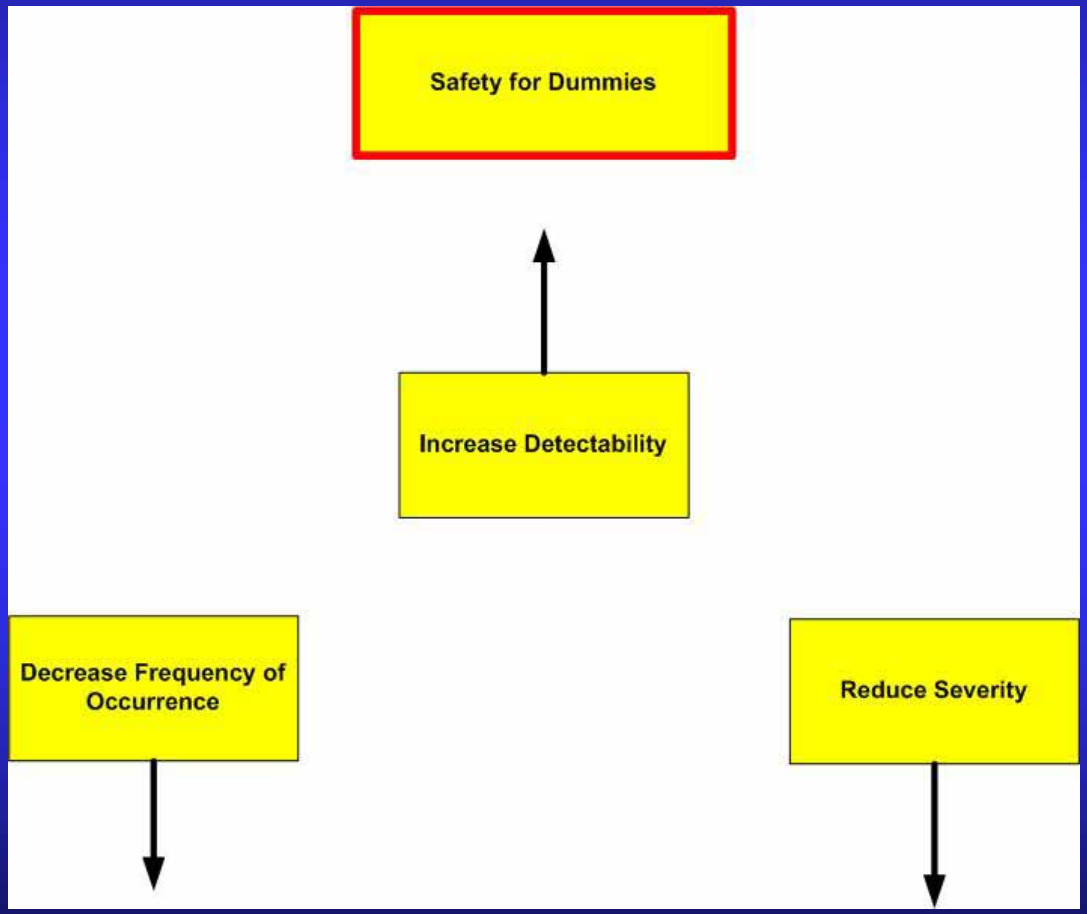
- Forcing functions and constraints
- Automation and computerization
- Simplify and standardize
- Reminders, check lists and double check systems
- Rules and policies
- Education
- Information
- Punishment (no value)

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 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

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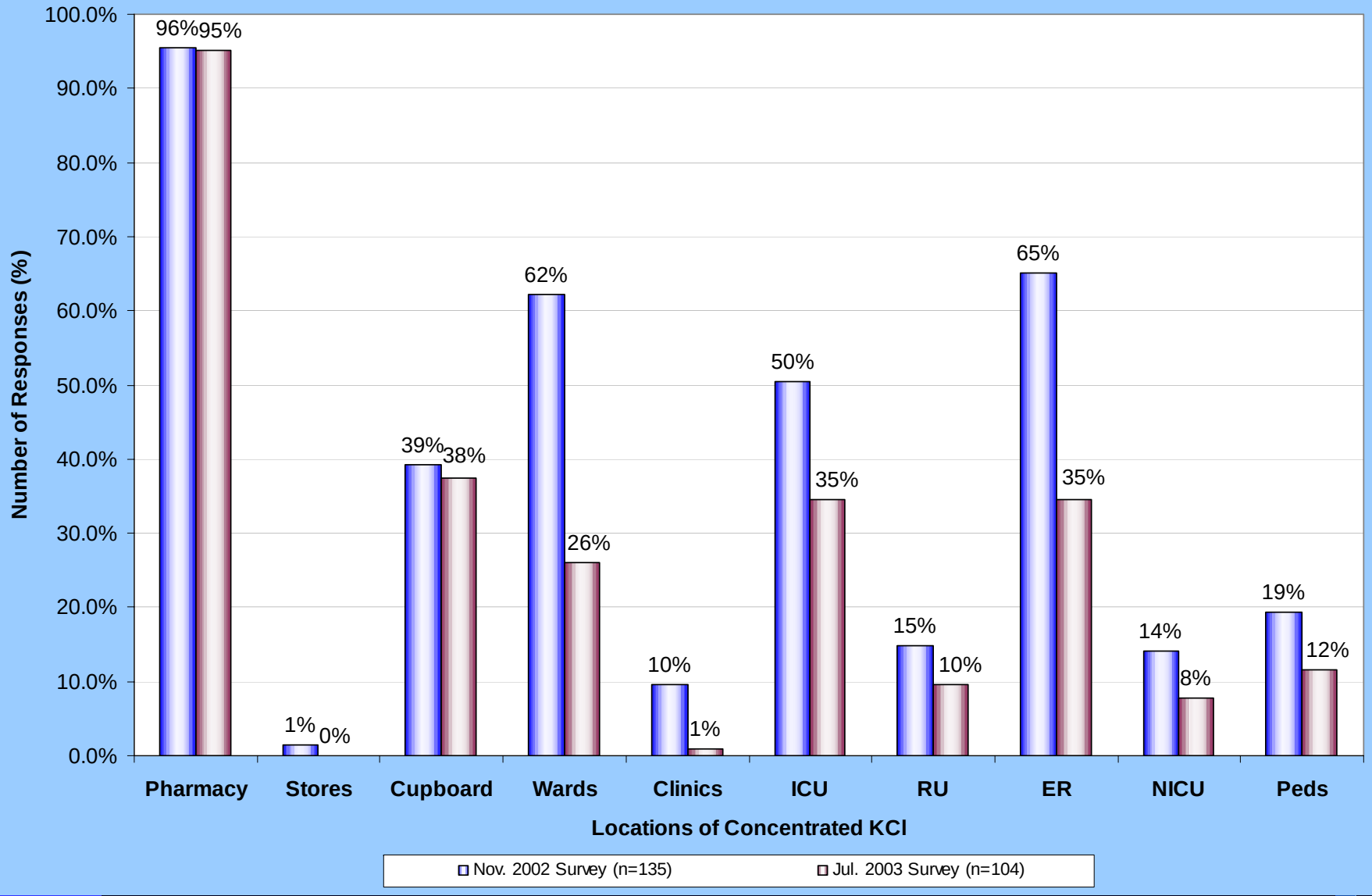
ISMP Canada Medication Safety Support Service

Potassium Chloride Concentrate Follow Up Survey



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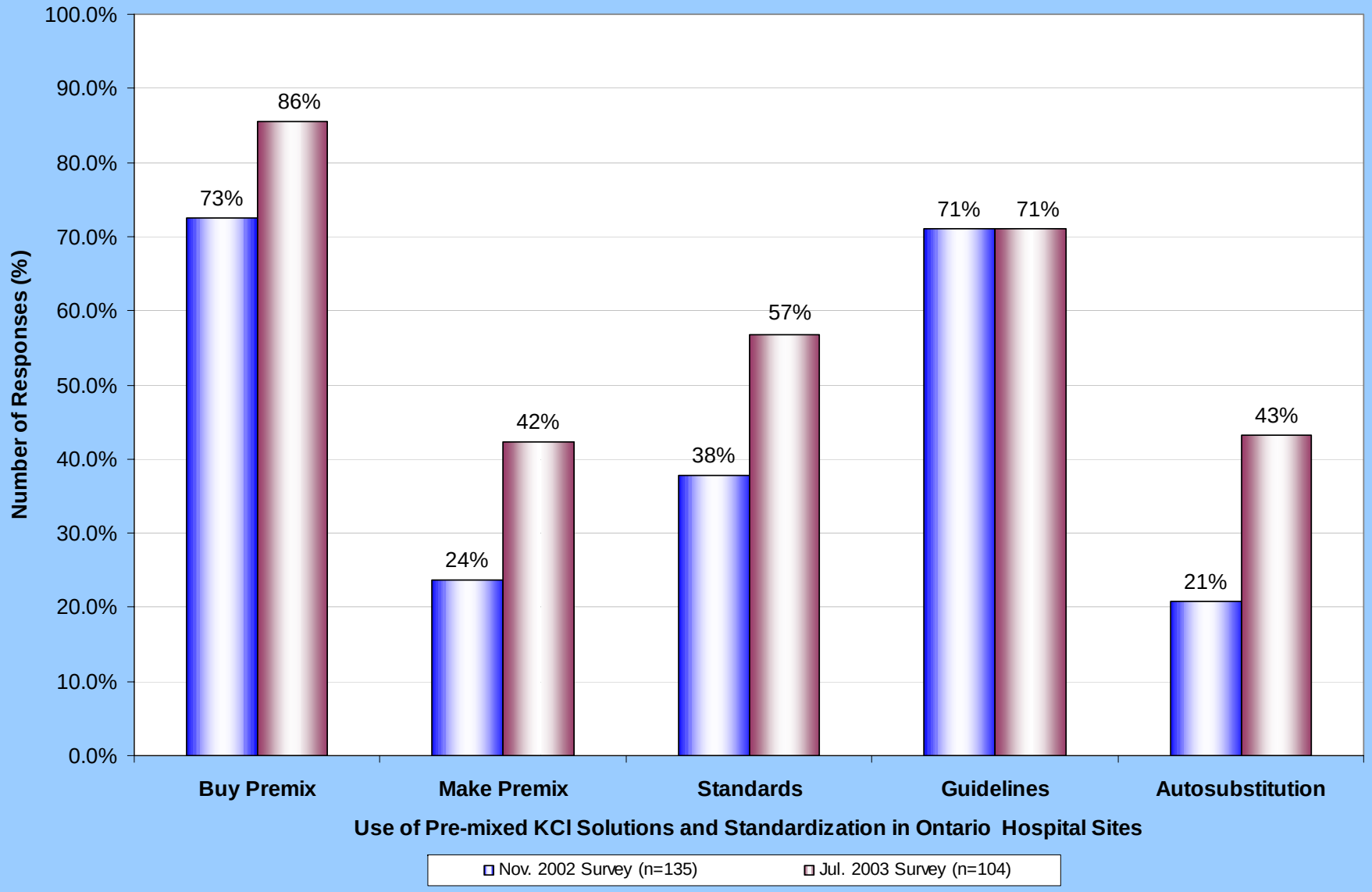

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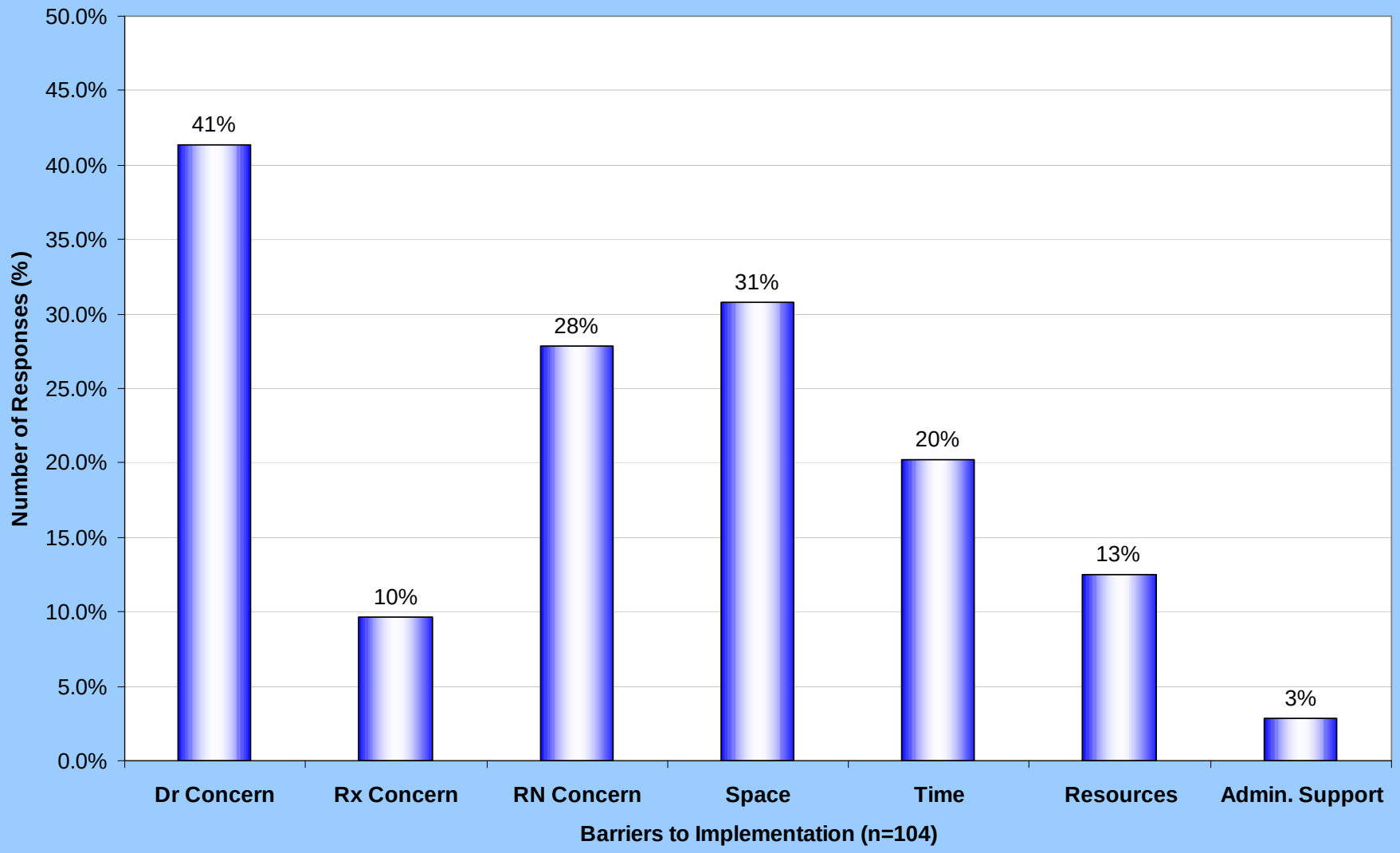

Other Potassium Issues

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

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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

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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

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Narcotic Medication Safety Initiative

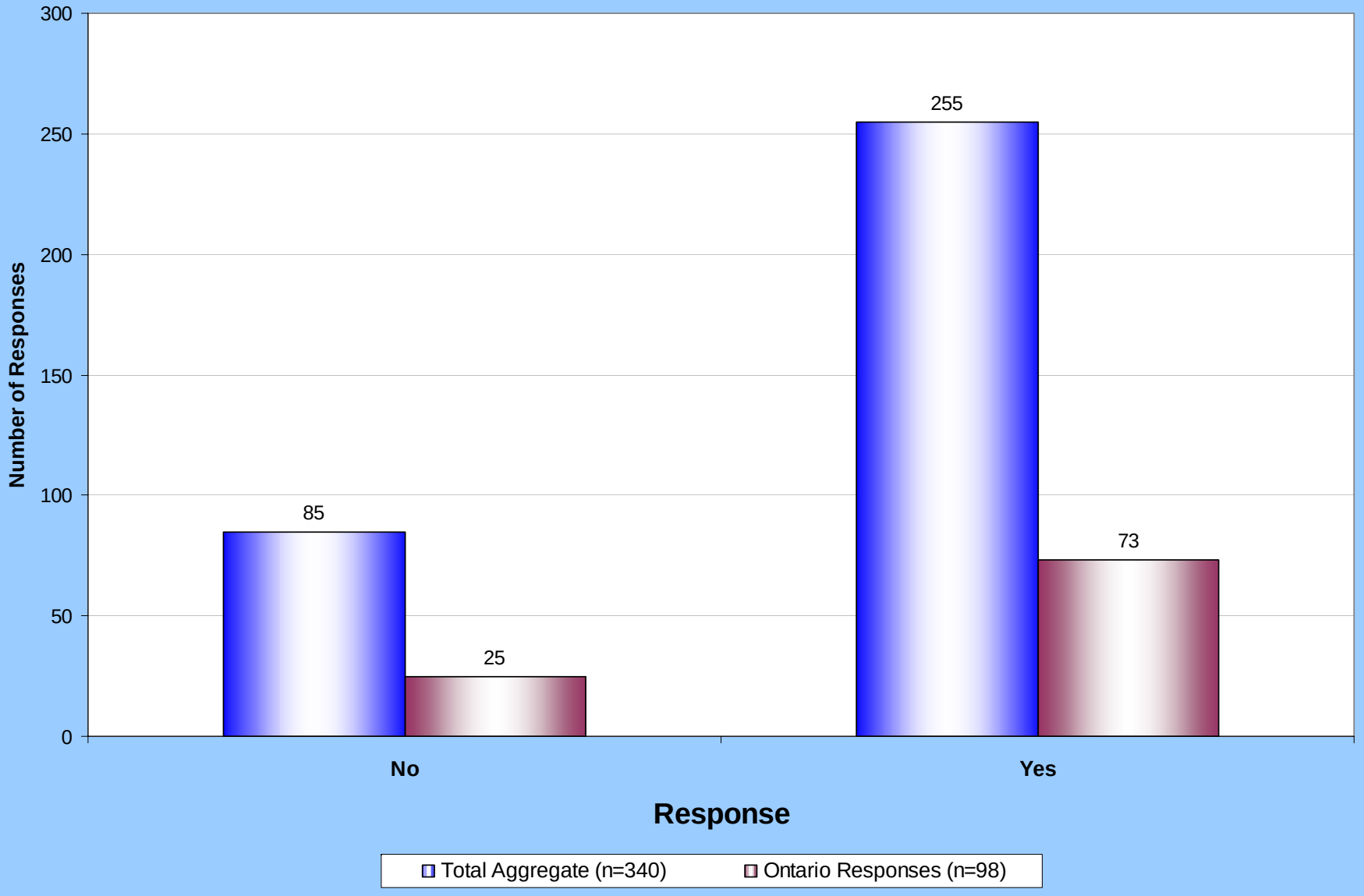
- Independent Double Checks
  - Developing documentation process for selected independent double-checks

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

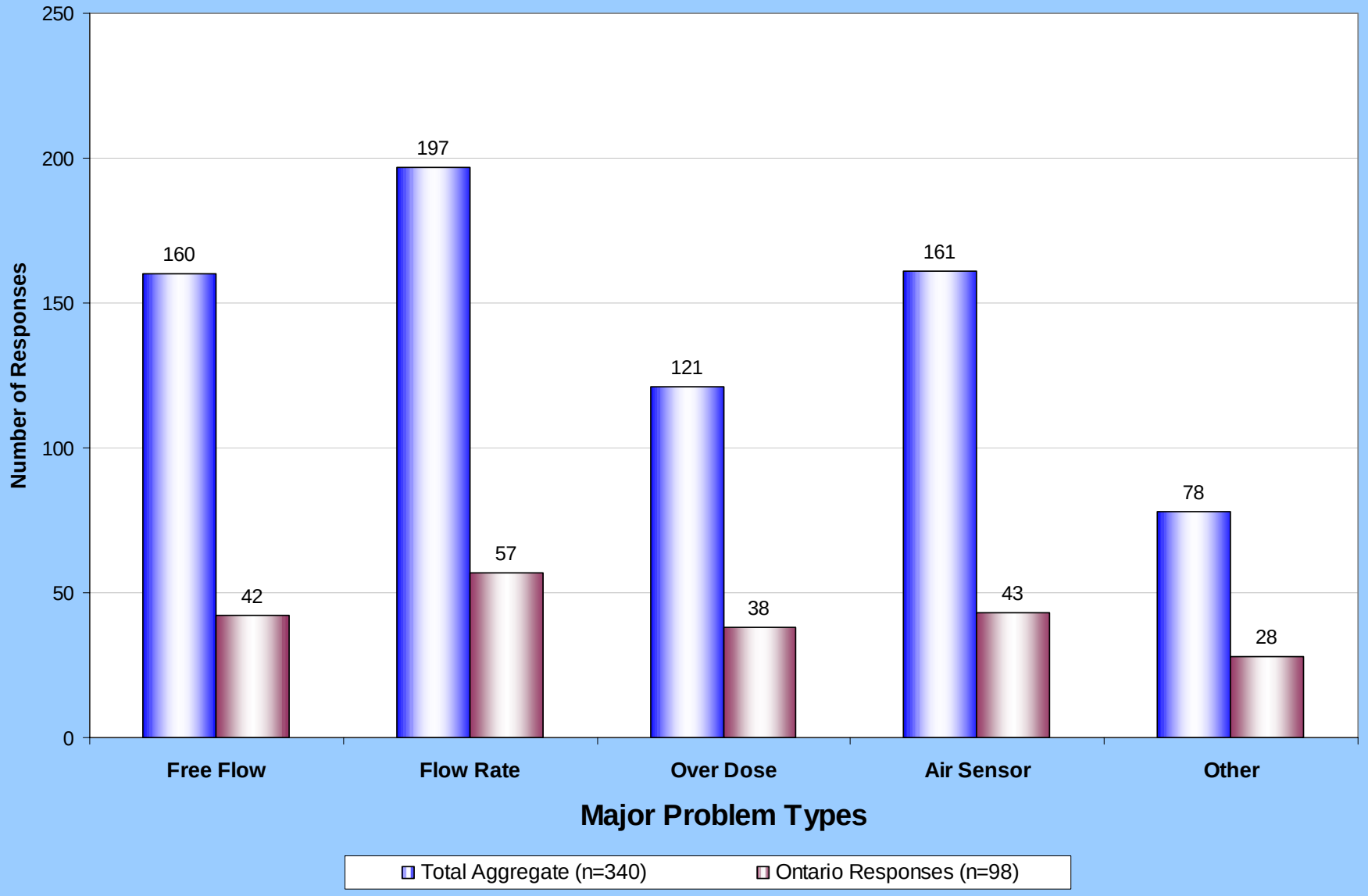
ISMP Canada Infusion Pump Safety Project

Pump Problems Encountered



ISMP Canada Infusion Pump Safety Project

Pump Problems Reported



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

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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

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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

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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

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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

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