

Technologies to Prevent Medication Errors in Hospitals

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ISMP CANADA

Vision:

- ◆ ISMP Canada is an independent Canadian nonprofit agency established for the collection and analysis of medication error reports and the development of recommendations for the enhancement of patient safety.
- ◆ ISMP Canada serves as a national resource for promoting safe medication practices throughout the health care community in Canada.

ISMP Recent Projects on Medication Safety

- ◆ **Canadian Medication Incident Reporting and Prevention System (CMIRPS)**
- ◆ **Systems Analysis of Medication Errors (SAME)**
- ◆ **Ontario medication error database**
- ◆ **Safe Medication Support Service**
 - ◆ **Potassium Chloride**
 - ◆ **Opioid Narcotics**
- ◆ **Infusion Pump Survey**

Bar Coding Technology

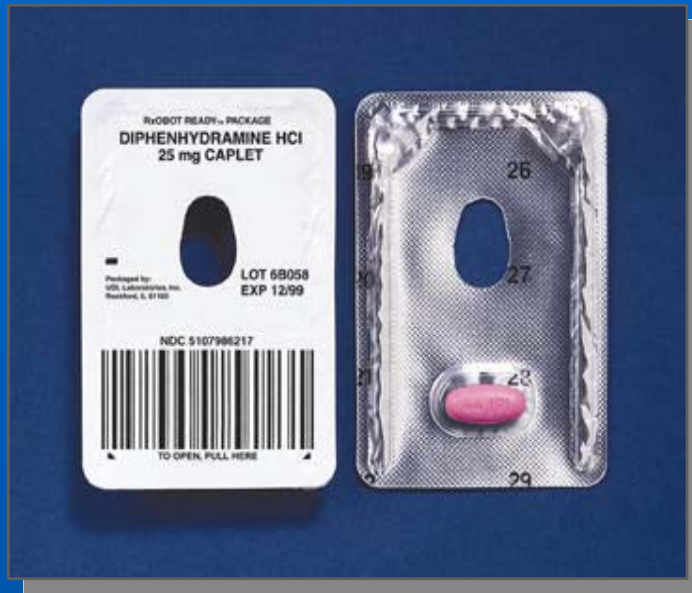
- ◆ Bar coding provides a safeguard against errors at the most vulnerable stage of the medication process--administration.
- ◆ Bar coding can save lives and dollars while increasing overall staff efficiency.

Bar Coding: The Foundation for Error Prevention

- ◆ **Error prevention starts with bar coded medications**
 - ❖ Accurate dispensing and administration
 - ❖ Consistent, legible labeling
- ◆ **Packaging**
 - ❖ On-site packaging service and inventory management
- ◆ **Robotic dispensing**



Bar Coding



Bar-Coded Enabled Point-of Care (BPOC)

- ◆ Care-giver
- ◆ Patient wrist band
- ◆ Medication profile
- ◆ Medications
- ◆ Electronic MAR

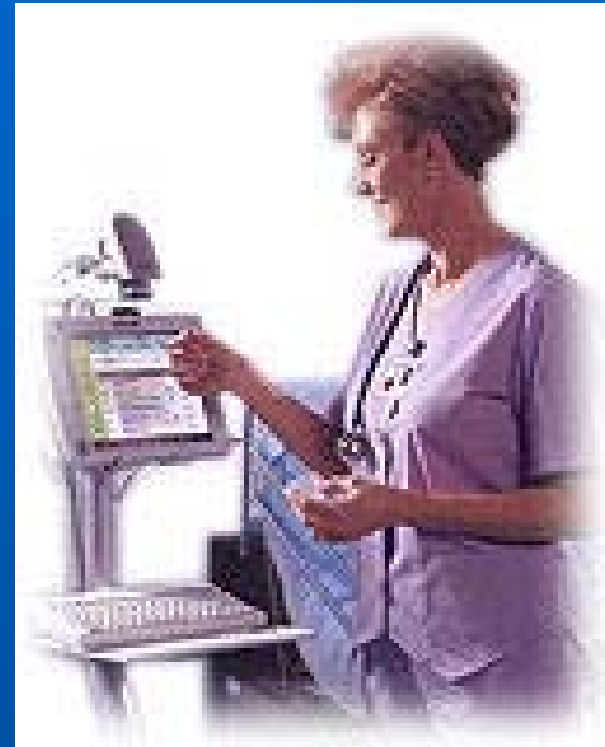
Bar-Coded Enabled Point-of Care (BPOC)



Accurate Administering

Automated bedside verification

- ◆ **Provides legible on-line MAR**
 - ❖ **Enhances care team communications**
 - ❖ **Comprehensive charting for enhanced billing**



Critical Success Factors

- ◆ **Universal bar coding**
- ◆ **Readability**
- ◆ **Bar code mapping**
- ◆ **Bar coding policies and procedures**

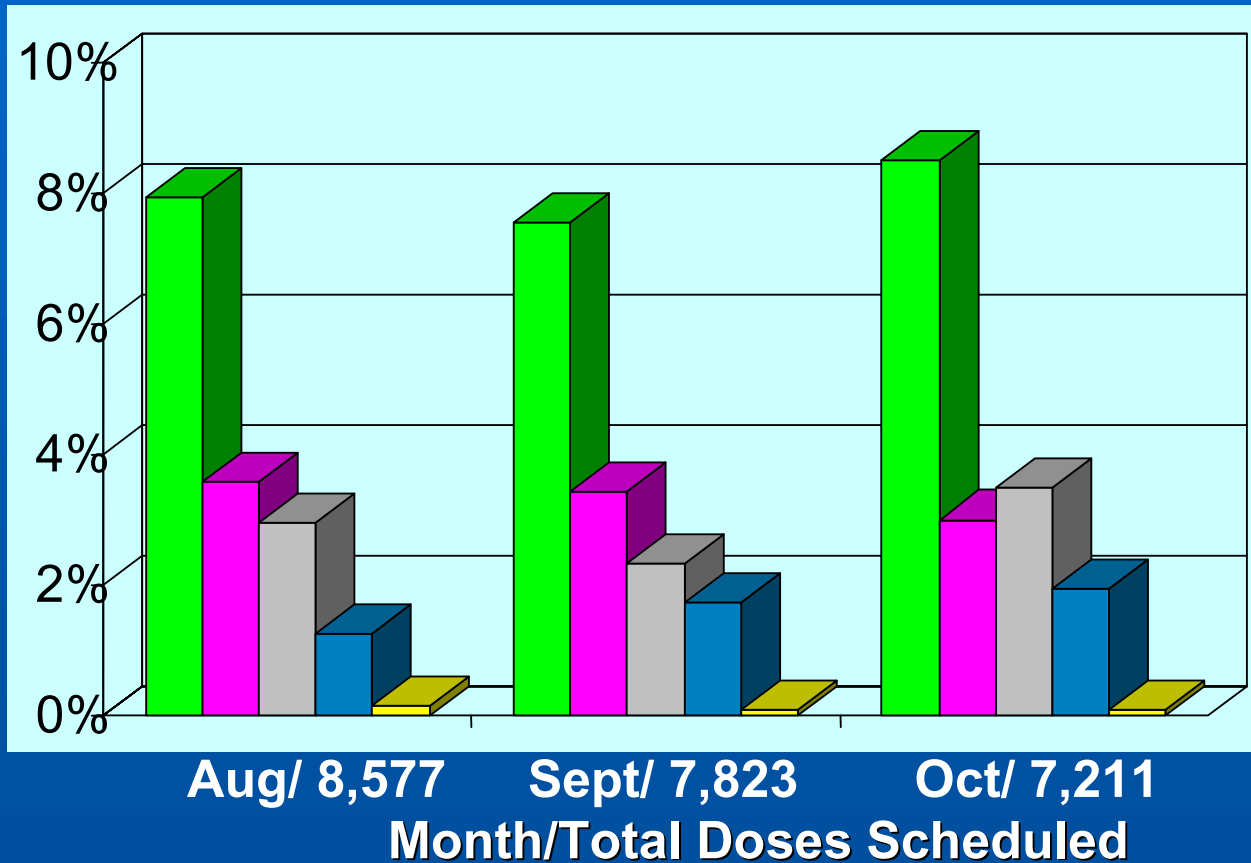
Bar code and Medication Administration

Between 1993 and 1999:

- ◆ 74% improvement in wrong drug errors
- ◆ 57% improvement in wrong dose errors
- ◆ 91% improvement in wrong patient errors
- ◆ 92% improvement in wrong time errors
- ◆ 70% improvement in missing doses

Potential Errors Avoided

As a % of Doses Scanned



- Total
- Overdose
- Underdose
- Wrong Med
- Wrong Patient

Bar-code potential limitations

- **Inconsistent/lack of uniform bar code by manufacturer**
- **Labor intensive repackaging process**
- **Human error in repackaging**
- **Inability to bar code all drugs and solutions (complex solutions, etc.)**

Bar-Coding in US

- ◆ **FDA Bar-code regulation 2003**
- ◆ **Drug names and Dose**
- ◆ **Summit of Bar-Coding, Sept 17-18, 2003 Chicago**
- ◆ **ISMP & ASHP – Expiry date and Lot # required**

Bar-Coding in Canada

- ◆ **Used in inventory management**
- ◆ **No Legislation Required from HC**
- ◆ **Some Pharmaceutical taking initiatives**
- ◆ **ECRx (CPhA) Medication Error Committee**
- ◆ **Projects undertaken in Community Pharmacies**

Challenges

- ◆ Leadership (government, organizations)
- ◆ Lack of Standardization
- ◆ Pharmaceutical industry
- ◆ Buy-in from healthcare facilities
- ◆ Investment

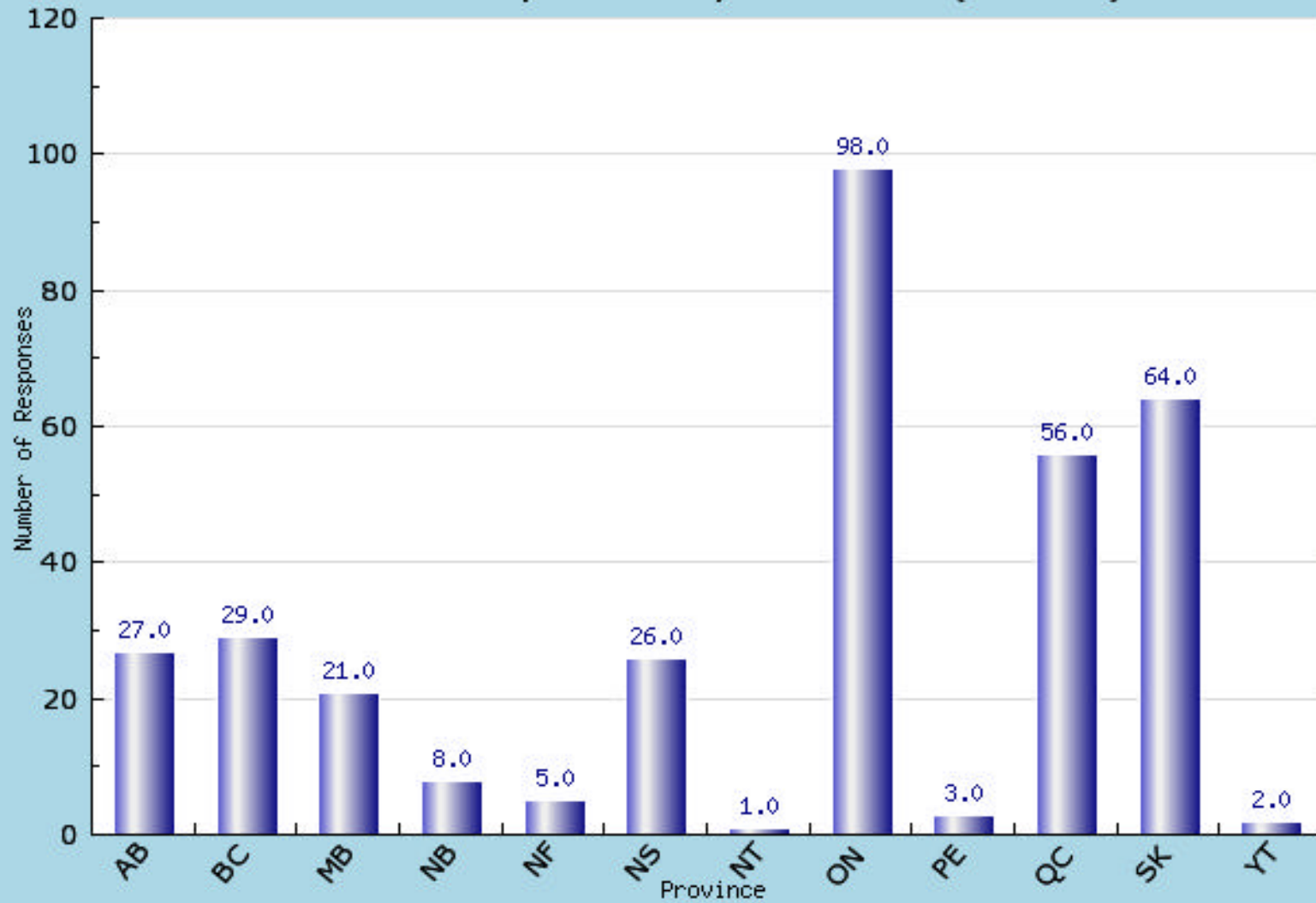
Impetus For

- ◆ **Adverse events (AE) and critical incidences (CI) to infusions and infusion pumps**
 - ❖ examples reported to ISMP Canada
- ◆ **JCAHO mandates free flow protection on infusion pumps**
 - ❖ 1 of 6 goals for this year
 - ❖ 2nd year in a row

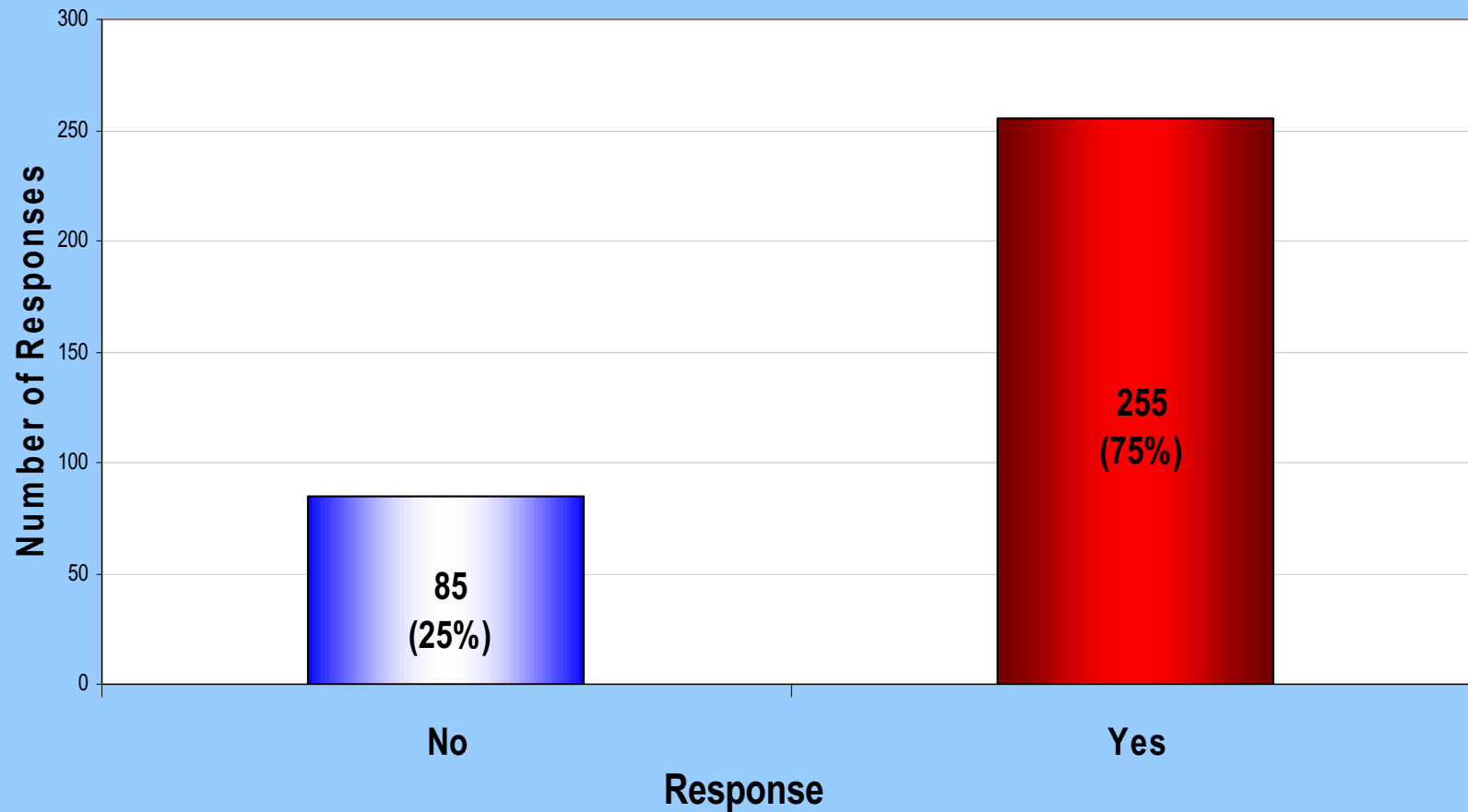
Objectives of Canadian Infusion Pump Survey

- ◆ To explore the existing level of infusion pump problems in Canadian Hospitals
- ◆ To obtain data on pump problems experienced in Canadian Hospitals
- ◆ To prioritize infusion pump issues
- ◆ To develop strategies for safer infusion pump use
 - ◆ equipment and practice

ISMP Canada Infusion Pump Safety Project
Number of Responses by Province (n=340)

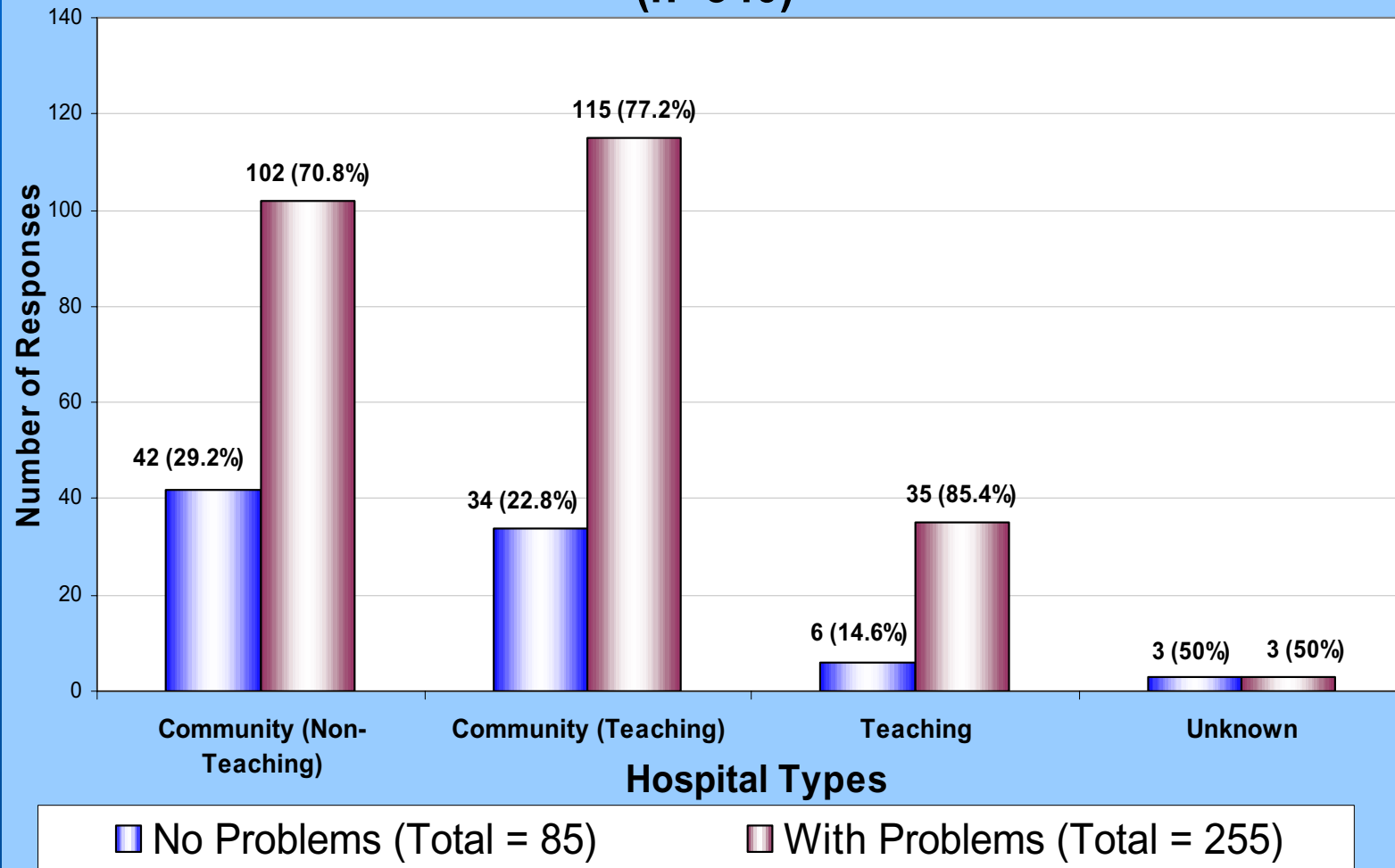


ISMP Canada Infusion Pump Safety Project
Pump Problems Encountered (n=340)

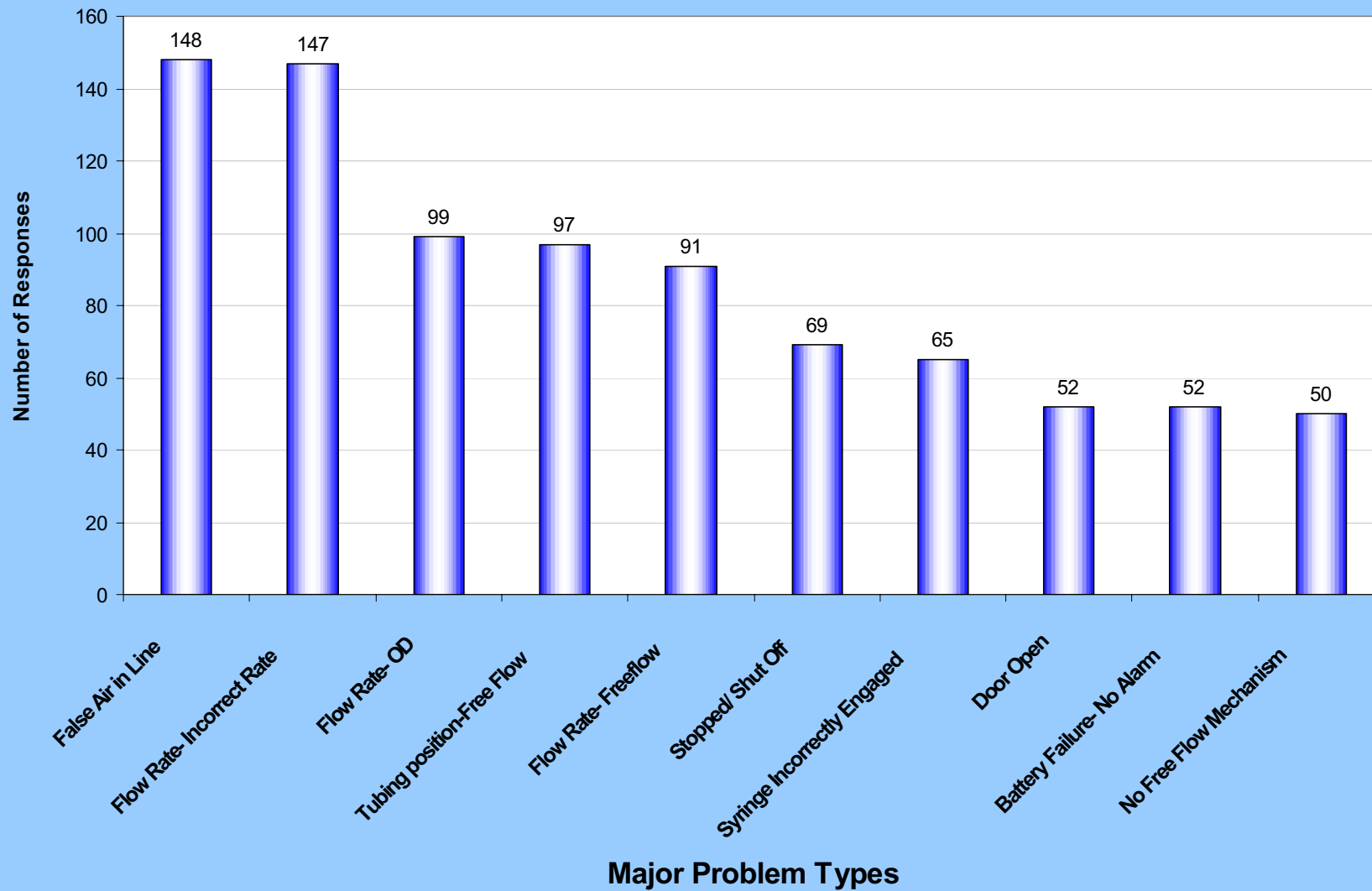


ISMP Canada Infusion Pump Safety Project

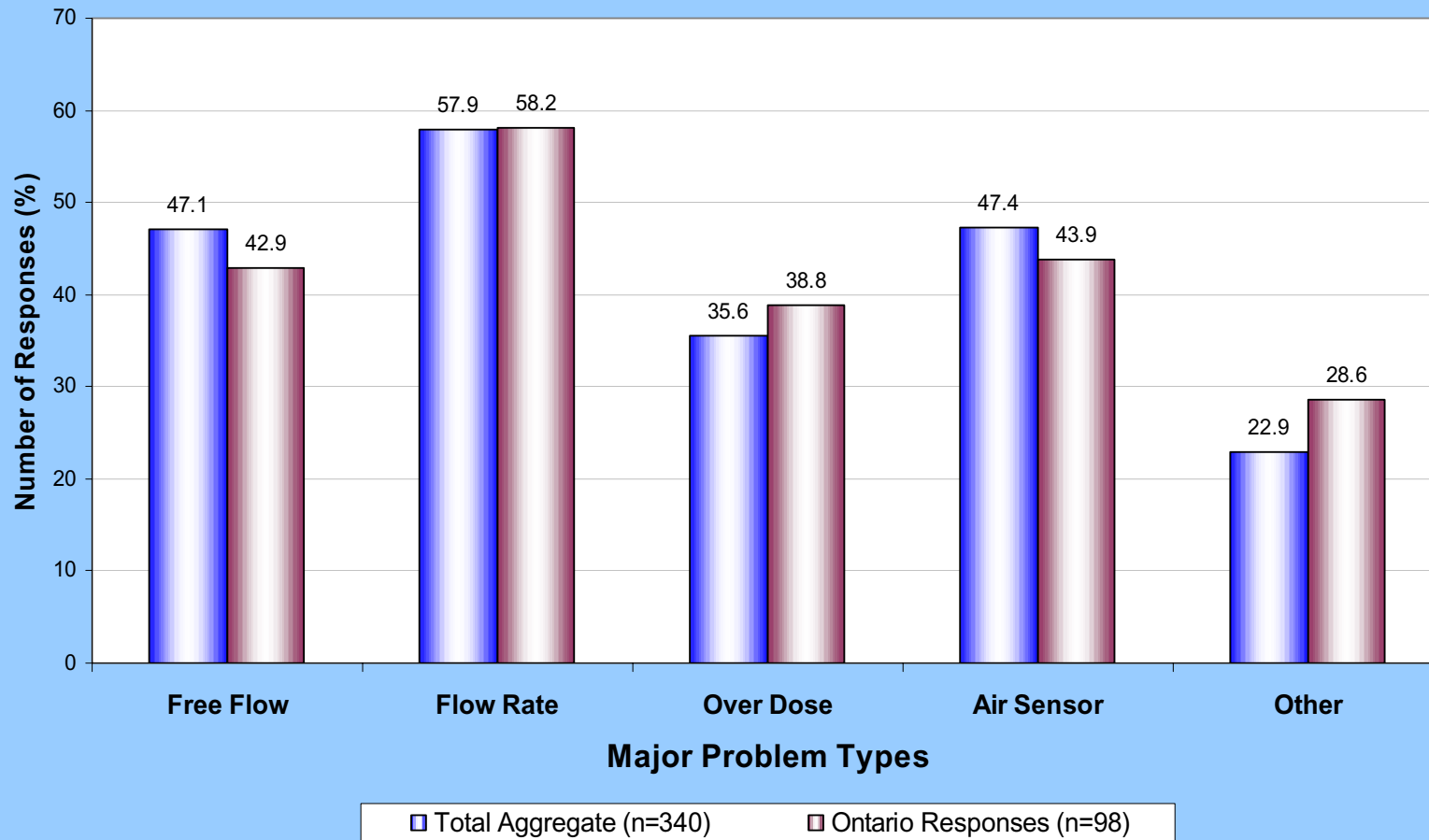
Pump Problems Encountered by Hospital Type (n=340)



ISMP Canada Infusion Pump Safety Project Top 10 Pump Problems (n=340)

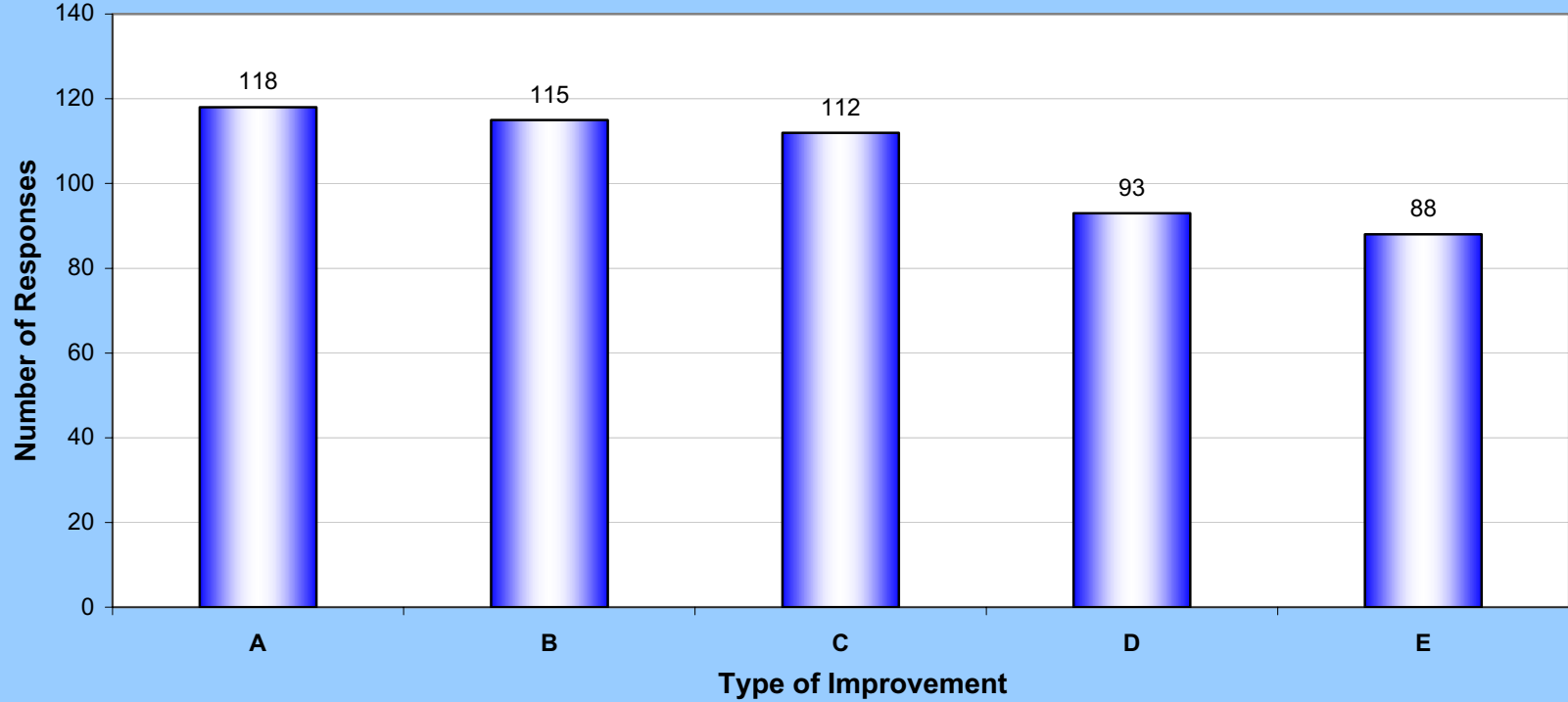


ISMP Canada Infusion Pump Safety Project Pump Problems Reported in Percentages



ISMP Canada Infusion Pump Safety Project

Top 5 Desired Pump Improvements (Total=231)



- A. On screen programming instructions
- B. Protocol programming
- C. Ability to program clinical minimum/maximum drug concentrations or dosing parameters
- D. Clarity of display
- E. Ability to program 'primary' versus 'secondary' infusion rates

Comments Received

Free Flow (26):

- ◆ “set removed from pump without clamping”
- ◆ Tubing:
 - ◆ “if tubing is removed incorrectly during cleaning damage may occur with pieces of tubing not visible remaining inside mechanism. If new tubing inserted freeflow situation can occur”
 - ◆ “tubing stretched out too much”
- ◆ “Free flow mixing with primary and secondary IV dose occur”

Comments Received

Overdose (23):

- ◆ “set removed without clamping”
- ◆ “with a CADD pump”
- ◆ Equipment:
 - ◆ “defective part”
 - ◆ “dirty detection sensor”
 - ◆ “failure of pumping mechanism-too much fluid went through in a short time, one time”
- ◆ “Pump programmed in mLs/ min instead of mLs/ hr”

Comments Received

Overdose continued:

- ◆ “Epidural concentration set at peripheral rate”
- ◆ “...when there are too many lines and nurse confuses the settings.”
- ◆ “tubing not positioned properly in pumping mechanism”
- ◆ “...syringe loaded incorrectly and pump read incorrect size of syringe and continued to infuse.”

Comments Received

Incorrect Flow Rate (34):

- ◆ **Battery**
- ◆ **“suspected source undetermined”**
- ◆ **“patient initiated”**
- ◆ **“primary infusing instead of secondary”**
- ◆ **EMI**
- ◆ **Equipment**

Comments Received

Incorrect Flow Rate continued:

- ◆ “PCA-wrong end of tubing attached to medication bag-pump did not alarm”
- ◆ Incorrect input of medication concentration
- ◆ “Lines switched to wrong channel”
- ◆ “Problem with one brand of syringes which was used in the syringe pumps. Pump would miscalculate syringe size....”

Comments Received

False Air in Line (16):

- ◆ “have had incidents where the tubing was completely empty and the alarm didn't go off and other times, the alarm would go off because of a tiny bubble of air hardly visible to the human eye”
- ◆ “false air in line alarm ,especially when running albumin”

Smart Pumps

- ◆ **Medley by Alaris Medical Systems**
- ◆ **Colleague CX by Baxter Healthcare Corporation**
- ◆ **B. Braun**

Assessing and implementing new technology

- ◆ **Small team of users**
- ◆ **Evaluate vendors and visit sites where implemented**
- ◆ **Failure analysis/literature review**

Assessing and implementing new technology

- **Before implementation, remedy process problems**
- **Require vendor support during implementation**
- **Stimulate reporting of errors/potential error (streamlined process, focus groups, etc.)**
- **Do not place sole emphasis, resources, reliance on automation while sacrificing other safety initiatives**

Potential problems with automation

- ◆ **Over reliance can instill a false sense of security**
- ◆ **Belief that the immediate effects of automation alone will ensure safety**
- ◆ **Some infrastructure changes necessary**
- ◆ **Assuring technology is used as intended**