Breaking New Ground: Canada's First Hospital Implements Bidirectional Smart Infusion Pump Interoperability to Improve Patient Safety

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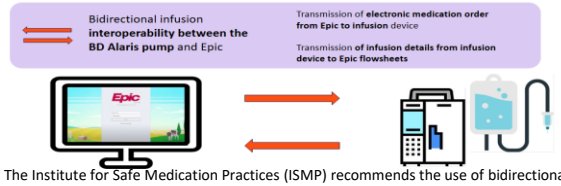
Background

Bidirectional Smart Infusion Pump Interoperability uses barcode scanning and Wi-Fi to enable two-way communication between pump and the electronic health record (EHR), enhancing medication safety by minimizing manual intervention and automating key steps in the infusion process. Despite implementing drug error reduction software in 2012, safety incidents have continued, and internal reviews have identified Interoperability as a highly effective strategy to reduce harm.



The Institute for Safe Medication Practices (ISMP) recommends the use of bidirectional interoperability to reduce infusion pump errors.

Benefits of Bidirectional Interoperability:

- Reduces infusion pump programming errors
- Ensures accurate and timely documentation
- Streamlines infusion practices and clinical workflows

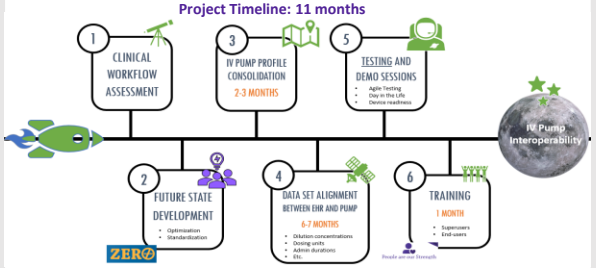
Objectives

To introduce a highly effective safeguard that reduces the likelihood of programming errors by automating EHR-pump data exchange through bidirectional smart infusion pump interoperability.

Methodology

A multidisciplinary collaborative approach was central to every phase of the project—from workflow mapping workshops and risk assessments to the optimization and standardization of infusion practices, data alignment, and extensive testing and training. This strong foundation enabled successful execution of the corporate project.

Project Timeline: 11 months



Overview of Resources

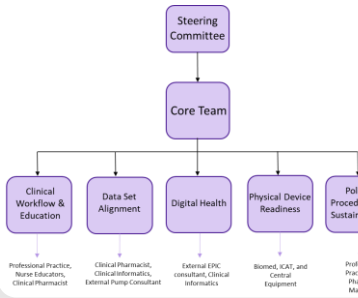
Departments
Pharmacy
Clinical Informatics
Professional Practice
Nurse Educators
Front Line Nurses
Project Manager
Information Technology
Biomedical
Operations Leadership
Vendor

Methodology Continued

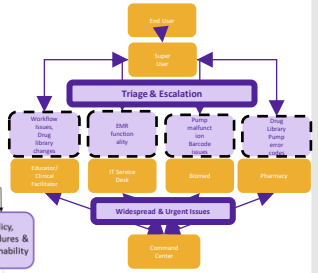
Scope for Interoperability

	In Scope	Out of Scope
Pumps	• BD Alaris PC Unit • Large Volume Pump (LVP) and Syringe modules for adults, paediatric, and neonatal populations	• Patient Controlled Anesthesia (PCA) pumps • Anesthesia pumps • Epidural pumps • CADD pumps
Patient Care Areas	• All Inpatient Units • Emergency Department (outpatient and inpatient) • Select ambulatory areas with Facility Administered Medications compatible with IV Interoperability	• Peri-operative areas • Ambulatory areas with Clinic Administered Medications incompatible with IV Interoperability or low infusion volumes • Areas lacking wireless coverage
Order Types	• IV Intermittent infusions • IV/Subcutaneous Continuous infusions • Fluids	• Blood components and blood products • One step medications (code narrator, procedural) • IV Push medications including range doses • Infusions programmed in the Basic Infusion Mode • Infusions with rates > 999 mL/hr

Project Governance Structure



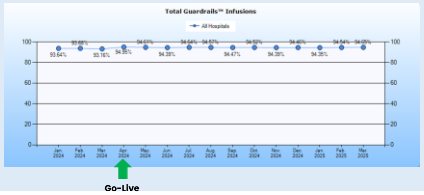
Go Live Strategy



Results

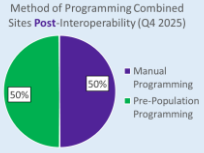
Total Guardrail Infusions: A percentage of total infusions using Guardrails vs. Basic Infusion (BD, 2025).

Demonstrates of all infusions approximately 95% are run using drug error reduction software (BD, 2025).



Method of Programming: A percentage of total infusions programmed manually vs. pre-population programming (interoperability).

- Demonstrates 50% of total infusions are leveraging interoperability post go-live
- Next steps include review of out of scope patient care areas for inclusion in interoperability scope

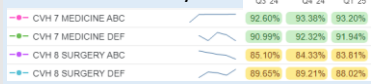


Interoperability Pump Programming Compliance: a medication administration is considered compliant if EHR acknowledges/overrides the response message received from the pump during administration and the response message that is put out by the pump is not categorized as an error. This data can be pulled from the EHR and can be drilled down to the unit level.

Overall

By Site

By Unit

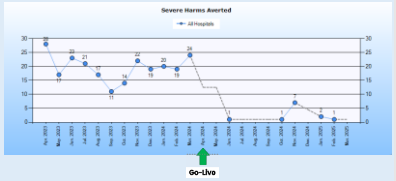


By Unit

Results Continued

Severe Harms Averted: A count of severe harm alerts obtained by harm index calculations (BD, 2025, p. 18).

- Demonstrates drugs deemed high risk which were reprogrammed after initially being programmed 2.5x or greater than the max dose guardrail (BD, 2025).
- Interoperability has significantly reduced the need for reprogramming of high risk drugs



High Risk Overrides: A count of override events associated with the severe harm potential, based on inherent drug risk and how much the programmed dose is over the Guardrails limit per the IV Medication Harm Index: Results of a National Consensus Survey (BD, 2025, p. 27).

- Demonstrates drugs deemed high risk which are overridden at 2.5x or greater than the max dose guardrail (BD, 2025).
- Supports identification of "workarounds" and supports determining hard limits (BD, 2025, p.27).

Measure	Data Collection	Pre- Interoperability (Baseline Measure) 6 months (Q3/Q4) 23/24	Post Implementation 6 months (Q1/Q2) 24/25
Reduction in transcription errors while programming the pump	Staff reported safety incident system	Reported: 6 incidences related to transcription Total incidences related to medications: 164 **3.6% within 6 months (pre)**	Reported: 2 incidences related to transcription Total incidences related to medications: 279 **0.7% within 6 months (post)**

LESSONS LEARNED

- Early engagement from all vendors and clinical teams was a key driver to support this transformational change.
- Challenges included:
  - Alignment between medication builds within the EHR and varying actual administration practices for IV medications (intermittent infusion vs IV direct)
  - In ambulatory areas, select types of medication orders did not support interoperability (clinic-administered medication vs. facility administered medication)
  - Patient movement between areas of the hospital required special focus
- Medication orders must be verified as a requirement to utilize interoperability functionality Adequate testing is required to ensure functionality is working as intended
- Ongoing multi-disciplinary collaboration and management for interoperability requires resources to support ongoing data set alignment, testing, and device management

Conclusion

- Bidirectional infusion pump interoperability enhances medication safety in our hospital.
- Many lessons were learned throughout this project and other organizations may adopt these implementation learnings.
- Compliance monitoring data both the EHR and the infusion pump revealed:
  - Infusion pump interoperability compliance at greater than 80%
  - Guardrail compliance approaching 95%
  - Significant reduction in severe harm incidents