



# Implementing Continuous Quality Improvement Methods to Enhance Patient Safety with Smart Pump Technology

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## Description

Until recently, Humber River Hospital (HRH) utilized two types of infusion pumps for medication infusions. In June 2018, HRH standardized medication infusion delivery and enhanced patient safety by implementing the Sigma Spectrum Infusion Pump (SSIP). These single-channel pumps have built-in Dose Error Reduction Software (DERS), a tool for continuous quality improvement (CQI), that allow instantaneous wireless library updates via a dedicated server, and provide user alerts due to potential programming and technical errors. This technology enhances patient safety as pharmacy and nursing process improvements inform updates to the master drug library (MDL) while minimizing the impact of drug shortages.

## Aim

To achieve 98 percent DERS compliance by December 2018 for enhanced patient safety.

## Actions Taken

Levering CQI, multidisciplinary teams provide continuous feedback regarding the MDL. The pharmacy team reviews identified issues and recommends MDL updates. Since the hospital-wide implementation of the SSIP, the pharmacy team made two updates to the MDL to enhance DERS compliance and other safety aspects (Table 1 and Table 2).

| MDL version | Date   | Implemented Changes                            | Number of Affected Areas |
|-------------|--------|--|--------------------------|
| 5           | JUN 20 | No changes (hospital wide SSIP implementation) | 17                       |
| 6           | JUL 11 | Soft and hard limits                           | 6                        |
|             |        | New drug                                       | 4                        |
|             |        | Delivery option                                | 3                        |
|             |        | Volume to be infused                           | 6                        |
| 7           | SEP 13 | Soft and hard limits                           | 5                        |
|             |        | Variable entry                                 | 4                        |
|             |        | New drug                                       | 4                        |
|             |        | Delivery option                                | 2                        |
|             |        | Duration                                       | 1                        |
|             |        | Loading dose                                   | 2                        |

**Table 1. Implemented changes showing the number of affected areas for each MDL update**

| Drug/Fluid                     | Affected Care Area(s)                                 | Changes to MDL  |
|--------------------------------|---|---|
| All IV fluids                  | NICU  | Removed pre-populated VTBI.   |
| Amiodarone Continuous Infusion | CCU, ER-Adult   | Added 450 mg in 250 mL, deleted 900 mg in 500 mL entry and added variable option. ( Drug shortage)  |
| Ceftolozane/Tazobactam         | CCU   | Changed upper hard dose limit from 1500 mg to 3000 mg, and added upper soft dose limit of 1500 mg.  |
| Iron-Sucrose (all doses)       | Med/Surg, CCU   | Changed Delivery Bag from "Secondary" only to "Primary or Secondary" in Med/Surg care area, added clinical advisory "Iron Sucrose = Venofer" to CCU care area.                  |
| Magnesium Sulfate 2 g          | Med/Surg  | Changed Initial Infusion Duration from 1 hour to 2 hours.   |
| Nalbuphine                     | CCU, ER-Adult, Med/Surg, Obstetrics                   | Added new drug to the library due to match hospital formulary.  |
| Penicillin G                   | CCU, ER-Adult, ER-Peds, Med/Surg, Oncology, Peds, RDU | Changed amount from 50 mL to 60 mL and 100 mL to 115 mL to account for overflow, Added two new drug entries for use in Obstetrics only (2.5 million units and 5 million units). |
| Phenytoin Loading Dose         | CCU, ER-Adult   | Change lower hard limit concentration to 1 mg/mL and upper hard limit concentration to 10 mg/mL   |
| Procainamide                   | CCU, ER-Adult   | Addition of loading dose entry and increase upper hard dose limit from 4 mg/min to 6 mg/min   |
| Vancomycin variable entry      | CCU, ER-Adult, Med/Surg, Obstetrics                   | Change upper hard limit concentration from 5 mg/mL to 10 mg/mL and add upper soft limit concentration of 5 mg/mL, increase upper soft dose limit from 1500 mg to 1750 mg        |

Abbreviations: NICU - Neonatal Intensive Care Unit, CCU - Critical Care Unit, ER- Emergency, Med/Surg - Medical and Surgical Units, Peds - Pediatric Unit, RDU - Outpatient Renal Dialysis Unit, VBTI - Volume to be infused, IV - Intravenous.

**Table 2. Highlights of the changes to MDL**

## Summary of Results

HRH has successfully optimized patient care using wireless-enabled smart pump technology. Using CQI methods, the MDL was updated to improve DERS compliance and address any patient safety concerns. Post-implementation, DERS compliance was 97.9% after the first month. Since then, the monthly DERS compliance has been above 98% (Table 3).

| Month    | DERS Compliance | Number of Care Areas |
|----------|-----------------|----------------------|
| JUN 2017 | 74.8%           | 2                    |
| JUN 2018 | 97.9%           | 10                   |
| JUL 2018 | 99.0%           | 10                   |
| AUG 2018 | 98.7%           | 10                   |
| SEP 2018 | 98.2%           | 10                   |

**Table 3. Monthly DERS compliance results**