



# Optimization of smart infusion device technology reduces alert fatigue in a multi-hospital health system

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## Background and Rationale

- Smart infusion device technology contains dose error reduction software.
- Programmed infusion pump technology contains built in editable libraries with dose and rate limits.
- Alerts are displayed on device if minimum or maximum limits are exceeded and the device is overridden or reprogrammed.
- Alert fatigue, resulting from frequently occurring alerts for minimally harmful drug dosing, can cause nurses to ignore valid safety alerts.

## Objectives

- This optimization project focuses on an analysis of and intervention for frequently occurring alerts to which the most common nursing response was to override the alert in two seconds or less.

## Methods

- In 2008, Sisters of Mercy Health System (Mercy) started total replacement of standard IV pumps with smart infusion device technology.
- At the time of publication, smart infusion device technology had been implemented at nine Mercy facilities, involving 3,100 licensed beds and a total of 2,800 smart infusion point-of-care units (PCU). Each PCU transmitted programming data wirelessly to a server.
- Programming that caused alerts were analyzed using proprietary software which generated reports as follows:

- Dashboard - medications causing alerts
- Types of alerts - above or below hard or soft limits
- Action taken - override, reprogram or cancel

- Data from these reports were displayed in an executive summary that trended the results for comparison facility to facility, month to month and year to date.
- A collaborative process was developed involving a group of internal experts including nurses, clinical pharmacists, quality and safety leaders, and physicians.
- Standardization of medication concentrations and volumes were mandated across all hospitals within the Mercy system.
- Nuisance alerts were identified as alerts that occur frequently that involve medications and or dosage ranges within minimal inherent harm limits.

Date of requested change	Library Type (Cont, Int, IVF, PCA)	Medication	Issue Identified	Profile						Comments	
				Critical Care	L&D/OB	Med Surg	NICU	Onc/Infus	PCU		Peds
12/20/2008	Cont	Fentanyl	Changed Hard Max to 200 mcg/hr	X							Accommodate current practice
3/23/2009	Cont	Methylprednisolone	Combined spinal cord injury and standard therapy into one entry	X							Spinal cord injury protocol not used very often.
9/23/2009	Int	Zosyn	Extended time interval to allow for 4 hour dosing	X							Accommodate current practice
9/23/2009	Cont	Propofol	Increased education in anesthesia							X	Were not utilizing anesthesia mode
12/21/2009	IVF	Lipids 20% under 1 kg	Changed soft min from 0.3 to 0.4 mL/hr				X				Accommodate current practice
7/20/2010	IVF	Blood	Changed Hard Max to 999 mL/hr	X	X	X	X				Accommodate current practice

## Results

- Between December 2008 and July 2010, six drugs and/or IV fluids were identified as causing a significant percentage of the total alerts in the month prior to the changes.
- Fentanyl- 501/7997 (6%), Propofol- 282/896 (31%), Piperacillin/tazo - 161/8961 (8%), Lipids- 86/1085 (8%), Methylprednisolone- 171/6782 (3%) and Blood products- 573/7548 (8%).
- Changes to the dosing limits in the drug library resulted in a clinically significant change in the proportion of alerts related to pump programming for each of these drugs. Fentanyl (p= 0.03), Propofol (p= 0.19), Piperacillin/tazo (p= 0.03), Lipids (p= 0.02), Methylprednisolone (p= 0.00), Blood products (p= 0.00).
- Analysis of the data by a multidisciplinary team concluded that changes to the dosing limits in the drug library would result in reduced nuisance alerts and improved patient safety.
- The most common nursing response was to override the alert in two seconds or less.
- Nuisance alerts were decreased by an average of 65% (35% to 100%) one month after the changes were made to the drug library.

## Conclusions

- Utilization of data generated from the smart infusion device dose error reduction software provided a retrospective collaborative approach to:
  - Decrease nuisance alerts for nurses
  - Increase patient safety
  - Improve clinical practice
  - Promote standardization

## Limitations

- Irretrievability of total IV infusions administered to reflect an accurate denominator.
- Limited resources to physically observe nurses to confirm that the five rights were followed during medication administration.

## Disclosure

Authors of this presentation have the following to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation:

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