

Smart Pumps: Achieving 100% Drug Library Compliance & Averting Medication Errors

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INTRODUCTION

Goals of the Project

- Uphold the health system culture of patient safety by improving medication administration processes and monitoring
- Standardization of practices, supplies, and implementation of new technology to decrease potential for pump related errors and associated patient harm

Problems Identified

- Old technology with limited safeguards
- Clinician manual programming for IV drip infusions
- Customized medication concentrations and infusions leading to large variability
- Multiple types and models of IV pumps and accessories throughout the organization
- Reporting of medication errors relied solely on direct observation and self reporting

IMPLEMENTATION

PHASE I

- Development of the multidisciplinary team with members from Pharmacy, Nursing, Education, Biomed, Materials Management, and Management
- Research and investigation regarding different vendors and technology available including site visits and testing of IV pumps in-house with our wireless system



Over 400 Outlook® ES pumps were installed throughout the health system, almost a full year from the start of the project!



PHASE II

Drug Library Development

- Pharmacy applied best practices and evidenced based guidelines for medication infusions to recommend standards for IV drip concentrations and infusions

Examples:

- Fenoldopam in both 10 mg/250ml and 20mg/250ml- standardized to 20mg/250ml
- Norepinephrine prescribed both mcg/kg/min and mcg/min dosing-standardized to mcg/min
- Epinephrine and phenylephrine dosed both mcg/min and mcg/kg/min-standardized to mcg/kg/min

- Collaboration between Pharmacy, Physicians and Nurse Clinicians to evaluate practices and preferences
- Safety "double-checks" including clinician advisories on high risk medications Heparin and Insulin
- Soft minimum and soft maximum dosing limits set for all drugs to alert clinicians of programming that is above or below the customized limits set
- Soft limits designed to warn but not restrict
- Hard maximum limits set for high alert drugs preventing clinicians exceeding specified dosing limit

PHASE III

- Drug Library Validation Workshop
 - Multidisciplinary review of the drug library by all areas
 - Nurses, physicians, and pharmacists included
- Training Workshops
 - Clinical Mentors (Resource staff for each area)
 - All nurses received hands on training immediately before pump implementation
- Patient ID scanning procedure with handheld and built in pump scanners for patient specific real time monitoring

INNOVATION

DoseTrac® Real Time Data

- Monitoring by clinicians and pharmacy to view pump settings, alerts and active alarms
- Pharmacists use real time monitoring to improve workflow and decrease turnaround times

DoseTrac Reports

- Retrospective reports of pump infusions and alerts to understand trends, identify education opportunities and drug library improvements

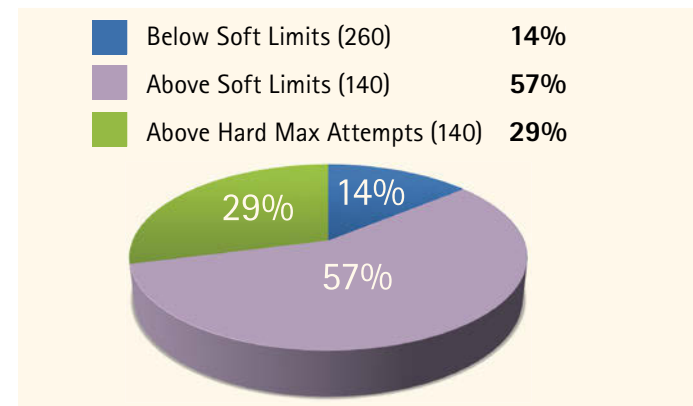
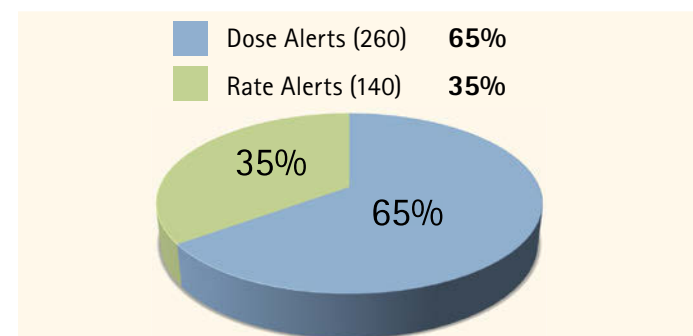
Technology Integration

- Smart pump IV solution is embedded with BMV process
- Smart pumps are integrated with nurse call and portable phone technology
- Alarms from IV pumps are directed through nurse call system directly to the phone of the primary caregiver

DATA ANALYSIS RESULTS

- Initial data analysis was completed 6 weeks post implementation
 - Total of 11,784 infusions – 35.34% used drug library

Post Implementation: Total 400 Alerts in 11,784 Infusions



INTERVENTION

- Weekly unit-based audits to assess and document drug library utilization and compliance due to
 - Overall low drug library utilization (35%)
 - High number of aborts
 - Wrong care area/location selections
- Targets of 95% established across key infusion pump metrics:
 - Dose delivered infusions, rate delivered infusions, correct location, and correct care area

OUTCOMES

Compliance Rates

	Target	12/2011	07/2012
DoseGuard™	95%	93%	100%
RateGuard™	95%	49%	100%
Correct Location	95%	92%	100%
Correct Care Area	95%	62%	100%

- Compliance increased to 100% through awareness, education, and process improvements
- Within the first three months of implementation, seven (7) adverse drug events were averted

LESSONS LEARNED

- Alert fatigue from soft maximum limits set too low vs. actual infusion practices was a concern
 - Limits adjusted to prevent potential alert fatigue and maintain safe dosing
- Ongoing education: Bolusing, oncology drug infusions
- Communication with staff
 - Outcomes, good "catches" and averted errors
- Custom concentrations could possibly increase errors:
 - Propofol entered as 10mg/100ml instead of 1000mg/ml could result in 100 times higher rate
 - Norepinephrine 8mg/250ml programmed as 4mg/250ml could result in an infusion rate double the intended rate
 - These examples demonstrate opportunities for error when custom concentrations are enabled
 - Supported decision to limit entering custom concentrations on as many drugs as possible
- Smart pump technology resulted in improving medication safety, preventing patient harm, faster recognition and response to alarming pumps, and further promoting a culture of safety!



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