Research and investigation regarding different vendors and development of the multidisciplinary team with members from PHASE I

Reporting of medication errors relied solely on direct observation. Multiple types and models of IV pumps and accessories throughout the organization.

Customized medication concentrations and infusions leading to clinician manual programming for IV drip infusions.

Old technology with limited safeguards.

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.

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.

 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/g/min dosing standardized to mcg/kg/min.
    - Epinephrine and phenylephrine dosed both mcg/kg/min and mcg/kg/ml-standardized to mcg/kg/min.
  - Collaboration between Pharmacy, Physicians and Nurse Clinicians to evaluate practices and preferences.
  - Safety "double-checks" including clinician advisors 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 limits.

 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.

- Smart Pump: Achieving 100% Drug Library Compliance & Averting Medication Errors
  - Christine Ruhl, BSN, CCRN, Nurse Manager CVU, ICU, Cardiology Services.
  - Cheryl Grogg, BSN, Nurse Manager HLC.
  - Presented at the American Association of Critical-Care Nurses National Teaching Institute, May 2013.

OUTCOMES
- Compliance Rates:
  - DoseGuard™: 99% 93% 100%
  - RateGuard™: 99% 49% 100%
  - Correct Location: 99% 94% 100%
  - Correct Care Area: 99% 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 100mg/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.

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

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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:
  - Dose Alerts (260): 65%
  - Rate Alerts (140): 35%
  - Below Soft Limits (260): 14%
  - Above Soft Limits (140): 57%
  - Above Hard Max Attempts (140): 29%

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 care area.
  - Correct Location: 95% 62% 100%
  - Correct Care Area: 95% 62% 100%
  - RateGuard™: 95% 49% 100%
  - DoseGuard™: 99% 93% 100%