Patient Controlled Analgesia (PCA): Quality Improvement Project to Decrease Pump Programming Errors

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Introduction/Background
Patient-controlled analgesia (PCA) is a medication delivery system that allows patients to self administer their own intravenous pain medication. The PCA Smart Infusion Pump has built-in safety features or limits that allow the patient to self administer medication within a safe range. The built-in safety features of the pump are dependent on accurate pump programming by the clinician. If pump programming errors occur patients are at increased risk for both oversedation and inadequate pain control.[1,2] To meet the wide dose range of pain management needs for patients, two PCA syringe concentrations are available, a low and high concentration. In 2017, the BWH Smart Pump team identified a trend in incorrect programming of these PCA opioid syringe concentrations.

Methods
The BWH Smart Pump team collaborated with clinical nursing staff, pharmacists, anesthesiologists, Quality and Safety leaders, Risk Management, and Partners eCare (PeC) teams to identify risk mitigation strategies and create a tiered implementation plan including:

- Interdisciplinary root cause analysis sessions targeting end user nursing staff to identify workflow and system issues that lead to programming errors
- Collaborative expert work group led by PeC to improve the ordering and display of PCA orders in the electronic health record (EHR) and added decision support to alert nurse if the PCA dose documented on the MAR or Flowsheet did not match the medication order
- Smart Pump drug library rebuild to improve the programming user interface per clinician feedback
- High alert labels on concentrated PCA syringes
- Hospital-wide education initiative

Results
In 2017, 11 incidents of incorrect PCA opioid syringe concentration programming were reported. Since implementing the risk mitigation strategies described above in October 2017, no further safety reports regarding incorrect programming of the opioid PCA syringe concentrations have been filed.

Discussion/Conclusion
Human graphic user interface (GUI) factors significantly impact patient safety technology effectiveness. End user participation in the creation and analysis of Smart Infusion Pump GUI-'s is critical for risk reduction. It is well recognized that opioids are high risk medications and pump programming is a complex, high risk process. The entire PCA process is also complex and has potential for errors; however, misprogramming the PCA syringe concentration leads to 10 fold overdose or underdose outcomes at our institution. Staff involvement in our risk mitigation plans was key to its success.

References
1. Grissinger, M. Misprogramming Patient-Controlled Analgesia Levels Causes Dosing Errors. Pharmacy and Therapeutics, 2012; 37-2;74–75
2. Hicks, R., Heath, WM., Sikirica, V, Nelson, W, Schein, J, et al. Medication Errors Involving Patient-Controlled Analgesia. Joint Commission Journal on Quality and Patient Safety, 2008; 34-12;734-742