Evaluation of Use of Electronic Patient Controlled Analgesia Pumps to Improve Patient Safety in an Academic Medical Center

Kumiko Ohashi, RN, PhD[1], Patricia Dykes PhD, RN, FAAN, FACMI[1,2], Kathleen McIntosh, RN[2], Elizabeth Buckley, RN[2], Catherine Yoon[1], Carol Luppi,BS RN[2], Anne Bane, RN, MSN[2], David W. Bates MD, MSc[1]

[1]Internal Medicine, Brigham and Women's Hospital, Boston, MA;
[2]Center for Excellence in Nursing Practice, Brigham and Women's Hospital, Boston, MA;
[3]Clinical Informatics Research and Development, Partners Healthcare System, Boston, MA

Introduction and Background

Patient controlled analgesia (PCA) and Patient-controlled epidural analgesia (PCEA) pumps are methods of pain control with complex smart infusion devices and are widely used in hospitals. Smart PCA/PCEA pumps can be programmed with the dose and rate of medications within pre-set ranges. However, adverse effects have been reported associated with these pumps' use. In this paper, we describe a prevalence observational study where observers used an electronic data collection tool to record pump settings and medications with PCA pumps, and compared them with their corresponding medication orders to identify errors.

Methods

We iteratively developed a web-based data collection tool (Redcap) to capture IV medication errors using a participatory design approach with interdisciplinary experts. Using the tool, a prevalence study was then conducted at a 793-bed tertiary care academic medical center in Boston, Massachusetts. Three inpatients units were recruited to participate in the study. Two trained nurses collected data on the Redcap tool and compared the infusing medication, dose, and infusion rate on the pump with the prescribed medication, dose, and rate in the medical record. All orders were obtained from electronic medical records. Tubing and labeling of the infusing medication according to hospital policies were also assessed. Each error was rated by NCC MERP INDEX by observers; all data was entered on the Redcap data collection tool. A safety intervention plan for improving PCA practice to support safe and effective pain management was developed after the first data collection and implemented for one year period. After the intervention period, a second data collection was conducted to evaluate effectiveness of intervention plans.

Results

The results showed that there were many labeling and tubing change tag errors, which were a violation of hospital policy. A few potential harmful medication errors were identified but no critical errors. Study results suggest the importance of a standard process of PCA pump use. In addition, results from the second data collection showed a reduction in error rates.

Discussion

Although there were not many high-risk medication errors, violations of hospital policy for tubing tags and labeling on IV were identified. Information from this study can be used to help to improve safety of administration process, identify areas where improvements in policy and practice are needed. Collecting the same data using the electronic data collection form will allow us to compare these findings across a broad range of hospitals. Our developed intervention plan contributed to eliminate potential harmful medication errors.

References

1. Fields M, Peterman J. Intravenous medication safety system averts high-risk medication errors and provides actionable data. Nurs Adm Q. 2005;29(1):78Y87.
2. Husch M, Sullivan C, Rooney D, Barnard C, Fotis M, Clarke J, Noskin G. Insights from the sharp end of intravenous medication errors: implications for infusion pump technology. Qual Saf Health Care. 2005 Apr;14(2):80-6.