Medication Reconciliation: A Practical Tool to Reduce the Risk of Medication Errors

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Preventable adverse drug events are associated with one out of five injuries or deaths. Estimates reveal that 46% of medication errors occur on admission or discharge from a clinical unit/hospital when patient orders are written. This study was performed to reduce medication errors in patient’s discharge orders through a reconciliation process in an adult surgical intensive care unit (ICU). A discharge survey was implemented as part of the medication reconciliation process. The admitting nurse initiated the survey within 24 hours of ICU admission and the charge nurse completed the survey on discharge. Baseline data were obtained through a random sampling of 10% of discharges in first 2 weeks of the study (July 2001-May 2002). Medical and anesthesia records were reviewed, allergies and home medications verified with patient/family and findings compared with orders at time of ICU discharge. Baseline data revealed that 31 of 33 (94%) patients had orders changed. By week 24, nearly all medication errors in discharge orders were eliminated. In conclusion, use of the discharge survey in this medication reconciliation process resulted in a dramatic drop in medications errors for patients discharged from an ICU. The survey is now a part of our electronic medical record and used in 4 adult ICUs and 2 medicine floors.© 2003 Elsevier Inc. All rights reserved.

THE INSTITUTE OF MEDICINE (IOM) report “To Err is Human” identified that patient safety is a significant problem and that efforts to improve safety must focus on systems rather than providers.1,2 Evidence from aviation supports the association between a culture of safety and reduced pilot errors.3 Aviation’s safety model involves the full continuum of staff, developing systems that insulate operators from error and celebrate employees as heroes.4 Specifically, systems designed for safety absorb error and remove preventable error from the realm of possibility. Success comes from multiple layers with overlapping focus, or independent redundancies, which are strategically placed throughout a system to stop error. Health care generally lacks such systems.5 Medication errors are among the most common type of error and an appropriate area to focus improvement efforts.6,7 Preventable adverse drug events (PADE) are associated with 1 of 5 injuries or deaths and a result of poorly designed systems, which often lack independent redundancies.5 When patients are discharged from one care area to another they are particularly vulnerable to medication errors. It is estimated that 46% of medication errors occur on admission or discharge when new orders are written for a patient.6 One strategy to reduce PADEs is to reconcile the medication orders between the two transition points; such as the intensive care unit (ICU) and the regular nursing unit. To reconcile, nurses review patients’ discharge medication orders and identify discrepancies between what patients are currently receiving and what they are prescribed in the discharge orders. This strategy is based on the conceptual model of independent redundancies; the practice of having independent checks, generally by different providers for key steps in a process.

As part of an effort to improve safety in our ICUs, we implemented a medication reconciliation program that was developed as part of our participation in the Institute for Healthcare Improvements Quantum Leaps in Patient Safety Program. OBJECTIVES

The specific aim of this study was to reduce medication errors in discharge orders by implementing a medication reconciliation process for all patients discharged from the surgical ICU in an academic medical center. We accomplished this by using the improvement model developed by Langley and Nolan.8

DATA SOURCES AND SETTINGS

Data were collected by using a medication reconciliation tool called a discharge survey. The pa
tient’s medical and anesthesia records were reviewed and the patient and family members queried regarding medication history. The setting was an adult surgical ICU at an academic medical center.

STUDY DESIGN METHODS

Medication reconciliation was developed and implemented in a 14-bed surgical ICU that receives 1,300 admissions annually, on average 25 per week, in an academic medical center. To achieve the study aim, a multispecialty team consisting of the director of patient safety (also an ICU attending), a pharmacist, a nurse administrator, a nurse from the participating ICU, a representative from Information Systems, and administration formed a work team to develop and implement a medication reconciliation system.

Medication Reconciliation Tool

Members of our working team created a data collection tool called the discharge survey to evaluate the extent to which medication errors were present in the discharge orders for patients leaving the surgical ICU. A nurse completed the data collection tool by reviewing the patients ICU record and discharge orders at the time of discharge from the ICU.

For this tool, the nurse reviewed the discharge orders and medical record and answered the following 3 questions: 1) Are the medications listed in the discharge orders the same as the patient is currently receiving; 2) Are the allergies listed correctly in the discharge orders; 3) Are the patients home antihypertensive medicines prescribed—based on evidence for improved outcomes with the perioperative use of beta blockers.9,10 If the answer to any of these questions was no, the nurse was instructed to ask the patient’s physician, generally the chief resident on the surgical service, if they intended to make this change. The nurse then asked the patient if the allergies and home medications were listed correctly. Our definition of a medication error was if, as a result of this process, the physician changed the discharge orders.

Implementation of Medication Reconciliation Tool

The medication reconciliation tool was piloted tested and revised. To obtain baseline incidence of medication errors in discharge orders, 2 research nurses abstracted approximately 15 randomly selected charts per week for 2 weeks. Based on the findings, the safety director went to the nurse manager and requested that the medication reconciliation process be part of routine ICU discharge. The nurse manager agreed, the work team developed standardized paper medication reconciliation forms and all ICU nurses were in-serviced on the use of the discharge survey. Based on feedback from staff, the discharge survey was revised. The nurse manager supported the intervention and the ICU’s Performance Improvement (PI) committee adopted the intervention, assisted in staff training, and encouraged staff to complete the survey on all patients.

Initially, staff resisted completing the discharge survey because they felt 1) it took too long, and 2) it was beyond their responsibility to monitor medications outside the ICU. In addition, it was difficult to obtain an accurate list of prehospital medications, requiring that the nurses review the medical and anesthesia records as well as interviews with the patient and/or their family. Based on continued feedback from nurses, the discharge survey was revised and listed all pre-hospital medications, medication orders in the ICU and medications ordered on discharge.

The ICU unit clerks placed a discharge survey in the front of every chart on admission to the ICU. The ICU nurse who admitted the patient initiated the discharge survey within 24 hours of ICU admission and the charge nurse completed the survey on discharge. If discharge orders were not accurate after reconciliation was complete, the nurse would page the patient’s physician to correct the orders. Nurses directed physicians to the discharge survey as a reference when writing or revising discharge orders. After 48 weeks, the paper forms were converted into an electronic form using the Eclypsis information system used in all our ICUs.

To help disseminate the intervention to other ICUs and train nurses, the research team developed an spread sheet that included instructions for completing the discharge survey, the data collection instruments, standardized graphs to evaluate outcomes, and a calculator to estimate avoided costs. This “project in a box” was then added to the Johns Hopkins intranet. Three other ICUs and 2 nursing floors are now using the medication reconciliation form.
DATA COLLECTION METHODS

The primary outcome variable was the percent of randomly audited medical records per week that contained a medication error in the discharge orders, defined as such if the physician changed the orders as a result of the information obtained through the medication reconciliation processes. Two research nurses audited approximately 10% of discharges (10 to 15 random patients) per week. The nurses conducted this audit 2 weeks prior and for 19 weeks after making the discharge survey part of routine nursing discharge.

The secondary outcome variables included 1) the number of times per week that the discharge orders were changed at least once as a result of the discharge survey and 2) the staffs compliance with completing the discharge survey, defined as the number of discharge surveys completed divided by the number of discharges per week. The research nurses reviewed all patient discharges to obtain compliance and intervention. The study was conducted from July 2001 through May 2002 with approval from our Institutional Review Board.

RESULTS

During the first 2 weeks, we obtained baseline data regarding medication errors, and found that 31 of 33 (94%) patients had their orders changed. As a result, the discharge survey became part of the routine ICU discharge process. Figure 1 displays the rates of medication errors per week that were identified by auditing approximately 10 randomly selected patients per week. Through the use of the discharge survey, we nearly eliminated medication errors in discharge orders (10 of the 25 [on average]) within the first 24 weeks.

As a result of the routine use of the discharge survey, the nurses changed on average 10 orders per week (Fig 2).

The use of the medication reconciliation form is now part of routine patient care; the tools used in all discharges. In Figure 3 we display the percent of ICU patients per week who had a completed discharge survey in their chart.

CONCLUSION

The use of medication reconciliation was associated with a dramatic reduction in medication errors in patients transferring from an ICU at an academic medical center. The medication reconciliation tool is now automated and part of our electronic medical record and used on all discharges. Nurse and physician perceptions support the data that using this tool is associated with significant improvements in patient safety. The process of medication reconciliation is based on the safety principle of independent redundancy—having independent providers ensure that key steps in a process are present. Through our medication reconcil-
ication, nurses and patients provided redundancy were for physician orders. The ability of nurses, pharmacists, and patients to serve as independent checks on key processes may provide a significant opportunity to improve care.

Use of the medication reconciliation has spread through other areas our institution. Four other adult ICUs are using the tool as well as 2 medicine floors. To help facilitate use of this tool, we created a "project in a box": a spreadsheet that contains all the instructions and tools needed to implement medication reconciliation. Indeed, medication reconciliation is one, if not the only, quality improvement initiative at our hospital that is self-perpetuating in that the staff is disseminating the intervention without administrative support. Even as hospitals implement computerized physician order entry (CPOE) to improve medication safety, they still need to reconcile the medications; that is, ensure that patients are prescribed the correct medicine and that allergies are listed correctly in all databases. As such, reconciliation should be viewed as part of a larger strategy to improve medication safety.

In addition, we are also applying this concept to patients being discharged home. We developed this tool after a patient discharged from the hospital without perioperative beta-blockers suffered an acute myocardial infarction. The use of medication reconciliation helps ensure that preoperative medication are continued throughout the hospitalization and upon hospital discharge. The medication reconciliation forms for these patients include the use of medications associated with improved outcomes and monitored by the Center for Medicare and Medicaid Services and the Joint Commission on the Accreditation of Healthcare Organizations (JCAHO); these include aspirin, beta blockers, cholesterol lowering agents as well as diet and exercise counseling.11-17

Through this study, we learned several lessons regarding the use of medication reconciliation. Not surprisingly, nurses play a vital role in advocating for quality and safety. Through the use of medication reconciliation, nurses can partner with patients, families, and physicians to improve safety. Second, performing medication reconciliation requires a collaborative culture. Medication reconciliation worked in this ICU because there is a collaborative culture. Third, the tools must be kept simple. Our original tool was too burdensome for nurses to use. We struck a balance between the burden of data collection, and the validity of our outcome measures by having team meetings weekly. These meetings created a forum to review and modify the medication reconciliation tool.

Fourth, the discharge survey can serve as a tool to help improve medication safety. Nursing staff started to provide the physicians with an accurate list of patient’s pre-hospital medications. By initiating the discharge survey and placing it in the front of all patient charts, nurses were able to direct primary teams to the list when they were writing discharge orders. Nurses also knew to assist with ICU discharge orders as they were written to ensure accuracy, thereby preventing the need to page the primary team physician.

Despite the success of this project, we recognize several limitations to our study. First, our definition of medication error is debatable. We desired a nonpunitive environment and believed our self admitted definition of a medication error (change the medical record) would be most accepted and allowed for the considerable clinical judgment that is required in writing discharge orders. Second, we only identified prescribing errors. We did not evaluate whether the medications prescribed were required nor did we evaluate dispensing and administering errors. Third, we reviewed 10 to 15 charts per week. Nevertheless, the use of run charts are an efficient and valid way to present data collected over time on a small sample. Fourth, we only present data from one ICU in an academic medical center. This intervention, however, is being implemented in many hospitals through both IHI and VHA initiatives to improve quality and safety.

In summary, using medication reconciliation is an effective and efficient method to reduce medication errors in discharge orders with minimal marginal costs. While use of computerized physician order entry may prevent most of these errors, few hospitals have CPOE; also, these systems still require someone to reconcile that medications are appropriate and accurate. To realize the benefits of CPOE, an accurate list of medications and allergies must be maintained in the medical record. We believe that medication reconciliation could have broad application to improve medication safety and look forward to further evaluation of this low cost intervention. The intervention took 20 minutes on admission and 20 minutes on discharge.
REFERENCES

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