



A process centered analysis of medication administration: Identifying current methods and potential for improvement

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ABSTRACT

Medication administration is an increasingly complex process that requires adaptability by nurses. In this study, twenty-one observational sessions of the medication administration process were conducted on a Medical/Surgical unit, and the processes used by nurses were analyzed to discover systemic process variability and determine possible best practices. When nurses instituted a patient medication order and medication review cycle prior to the other activities associated with medication administration, it was more likely that discrepancies in physician orders, electronic medication administration records, and missing medications would be mitigated within the same medication pass.

Relevance to industry: This research specifically investigates the process flows involved in medication administration. This work is a starting point in an effort to establish industry best practices and to identify the variables, such as technology use, facility layout, and process interruptions, which impact their standardization.

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1. Introduction

Medication administration is an ever more complex process influenced by the number of medications on the market, the number of medications prescribed for each patient, use of electronic technologies, facility design, and the numerous policies and procedures that govern control and administration. Most of the research to date has focused on the causes of medication errors without examining the underlying processes involved in the administration of the medication (Cohen, 2007; Institute of Medicine, 2007). Current medication administration processes involve many tasks, including but not limited to, assessing the patient to obtain pertinent data, confirming the five rights (right dose, right patient, right route, right medication, and the right time), gathering medications, administering the medications at the point of service to patients, and documenting administration while maintaining care and observing for side effects. It is necessary to understand the complexity involved in both the pharmacists' and nurses' processes and workflow to develop better safeguards and robust systems that reduce the probability of errors and adverse events. Therefore, this study focused on documenting the medication administration processes of nurses at one satellite hospital of a multi-hospital center to determine the level of process

standardization among nurses, as well as to identify which tasks could benefit from process improvement given the constraints of the system. This investigation contributes to the literature on medication administration by being among the first to describe in detail the process workflows and variations employed by different nurses on one nursing unit. It adds to the work by Elganzouri et al. (2009) by expanding the common categories of tasks performed by nurses administering medications from four to eight, which facilitates better description of tasks and variations.

2. Background

Safe, timely, and efficient medication administration in hospitals is an interdependent, multi-disciplinary process that requires collaboration and communication by physicians, nurses, pharmacists, pharmacy technicians, students, unit clerks, and others (Madegowda et al., 2007). With so many different people responsible for different tasks involved in medication administration, it is easy to understand that many opportunities for errors exist. Preventable medication errors are estimated to affect 1.5 million people in hospitals per year (Institute of Medicine, 2007), 7,000 of which end in fatalities (Institute of Medicine, 2000). A survey of 1384 nurses identified physicians' medication order illegibility and interruptions while administering medications to be the two main factors leading to medication administration errors (Wakefield et al., 1998).

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As the complexity of the medication administration process increases and as the personnel resources continue to be overburdened, many hospital administrators look to technology or increased staff training to improve efficiency and reduce error; and yet the problem is often embedded within the system processes and unable to be resolved with surface level treatment. Rather than putting a band-aid over the problem, a systematic examination is necessary to identify and resolve the deeper issues. Introducing new technology without fully understanding the interactions between current processes may provide, at best, only incremental improvements, and may in fact amplify other disconnects within the system causing more problems than they solve. Current processes must be examined, as a system, to seek improvements prior to implementing dramatic changes.

2.1. Factors affecting medication administration

The medication administration process is not fully standardized but instead allows some flexibility in the ordering and timing of task completion, as long as all tasks are completed according to the standards described in the hospital's policy and procedures. However, the interdependent nature of the process is such that the timing of actions of each staff member affects other staff members' ability to complete their tasks. When tasks are delayed, all tasks that require the completion of the preceding actions are delayed. For instance, patients cannot be taken to surgery without first having various tasks completed. If the consent document is missing or the preoperative medication has not been administered, for example, transport to surgery is delayed, the start time of the patient's surgery may also be affected, as well as all other surgeries scheduled for the day.

Patient factors such as the acuity of the illness, risk of complications, and complexity of the prescribed treatment plan determine the frequency of required assessment. Both the patient's condition and physician orders can change without notice and require immediate attention. Since the characteristics of the patient and the complexity of the treatment plan affect the medication administration process, it is often necessary for nurses to reprioritize tasks and deviate from their original plan. It is also important to minimize the negative effects of the change on the medication processes for all assigned patients.

Medication factors must be addressed every time medication is dispensed to ensure the accuracy of the medication administration in terms of the right dose, right patient, right route, right medication, and right time. Mayo and Duncan (2004) found that a "single [hospital] patient can receive up to 18 medications per day, and a nurse can administer as many as 50 medications per shift" (p. 209). While some researchers recommend more nurse education as the solution to preventing medication errors (for example see Tang et al., 2007; Mayo and Duncan, 2004, and Ulanimo et al., 2007), there are limitations inherent in this approach. Content unaccompanied by monitoring and coaching is not always successfully transferred to practice, and may diminish (wear off or fade) over time requiring periodic reminder sessions. Likewise, education must be repeated as staff turnover occurs and new medications are developed. These situations make orientation and inservice education a more costly solution (in terms of both time and money) than typically assumed. In general, inservice education is a much less effective method to improve performance when compared to the application of sound human factors techniques and properly engineered tasks to reduce risk and opportunities for system failure.

Another approach to reducing risk and preventing errors has been the addition of electronic technologies, some with dramatic results. Computerized physician order entry, computerized

physician decision support, robots for filling prescriptions, bar coding, automated dispensing devices, and computerization of the medication administration record are among the most promising technologies introduced to aid medication administration. Redesigned mobile medication carts, where medication is stored inside a workstation-on-wheels, are making their way into more and more hospitals. One study by Braswell and Duggar (2006) found that prior to mobile medication systems, nurses spent an average of 2.5 h gathering medications and supplies or waiting in line at central unit based medication cabinets. After the mobile cabinets were added, the time spent gathering supplies was reduced to 15–30 min per shift.

Unfortunately, these new technologies may not be fully accepted or trusted (see Montague et al., 2009) and can also add complexity to the nurse's task load if the current processes are not fully examined prior to implementation. The added complexity, in addition to the time necessary to complete the additional steps, can lead to workarounds and variations in care. Often these newer technologies are introduced in patient care areas without data on current workflow processes and a full understanding and examination of the impact they are likely to have prior to implementation (Elganzouri et al., 2009).

Nurses adapt their workflow procedures and workarounds to facilitate task completion (Tucker, 2004). This leads to variation in processes when comparing across nurses. Some personalized workarounds are more efficient than others are and may be heavily influenced by unit configuration and the patient care assignment system in use, with some requiring greater travel distances to administer care during a shift. Welton et al. (2006) found that, on average, staff nurses who were assigned to three patients walked just over 4.1 miles per shift while a nurse assigned to six patients walked over 4.8 miles. Highly visible, centrally-located medication rooms in high traffic locations have been identified as a factor associated with the volume of nurse interruptions, accounting for 22% of the total in one study (Potter et al., 2005). The activities associated with collecting supplies and traveling to and from patient rooms have also been associated with nurse interruptions (Ebright et al., 2003). Reducing the distances traveled and the frequency of repeated travel may have the affect of decreasing the number of interruptions and possibly errors in medication administration. By analyzing the way that nurses complete their tasks, best practices can be identified and policies and procedures revised to incorporate these workarounds as standard procedure.

2.2. Previous medication administration research

Given the significant impact on patient outcome and the extent of nursing resources devoted to medication administration, a number of studies have examined the process of medication administration. In a review of the current literature, previous research has focused on the amount of time spent administering medications and medication errors (for example see Elganzouri et al., 2009; Keohane et al., 2008; Poon et al., 2008). Many of the studies have utilized systematic descriptive observation or time-and-motion methods, but omitted detailed examination of the process flows or interactions between tasks in favor of quantifying the proportion of time spent on various activities, distance traveled, and interruptions or distractions that increase risk of errors. Elganzouri et al. (2009) investigated medication administration by nurses in three different settings, and based on their observations of uniquely individual practices among nurses with greater or lesser degrees of safety and efficiency, e.g. greater variability among nurses than across units, recommended further investigation at the detailed process level.

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