Workarounds:
Developing Definitions, Measurement Strategies, and Links to Medication Errors

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Structured Abstract

Purpose: First, we sought to develop a conceptual definition, operational definition, and measurement strategy for workarounds in the context of the medication process. Second, we documented the extent to which medication administration workarounds occurring in intensive care units can lead to medication errors.

Scope: Workarounds are improvised changes to work process to address blocks in work flow. Little research has captured the way healthcare professionals think about workarounds and the manner in which workarounds lead to potential patient risk in medication errors. This research is critical, as it could identify work flow changes that are necessary to improve patient safety and consistency in the provision of care.

Methods: The first objective was addressed with a survey study of personnel (pharmacists, physicians, and nurses) from intensive care units at one facility. The second objective was addressed with an interview study of nurses from intensive care units at four different facilities.

Results: Workarounds may have a significant negative impact on patient safety because of higher potential for medication errors. Interview techniques, though potentially more time consuming, may yield better results when trying to understand workarounds.

Key Words: Workarounds, Medication Errors, Intensive Care Units, Nursing, Pharmacy

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Purpose

This project had two primary objectives. First, we sought to develop a conceptual definition, operational definition, and measurement strategy for workarounds in the context of the medication process. This objective was addressed with a survey study of personnel (pharmacists, physicians, and nurses) from intensive care units (described below as Part I of the project). Second, we sought to document the nature and extent to which medication administration workarounds occur in intensive care units and the extent to which these workarounds can lead to medication errors. This objective was addressed with an interview study of nurses from intensive care units at four facilities (described below as Part II of the project).

Scope

Institute of Medicine (2004) reports on patient safety and medical error have led to an emphasis on reducing preventable patient errors. Areas of emphasis have included medication prescribing, dispensing, and administration errors. Research suggests at least 10% of administered doses of medication result in error (Barker & Allan, 1995). Moreover, Thomas et al. (2000) found that adverse drug events account for up to 19% of adverse events recorded in hospitals; of those, 35% were the result of preventable medication errors.

Healthcare organizations have implemented a variety of interventions to reduce medication administration errors, including health information technology (HIT) to support the delivery of medication, enhanced adverse event and error reporting processes, and realization of "no-blame" cultures. The intended goal of these interventions is to improve patient care quality and safety by increasing the reliability of patient care processes. Common to these interventions is redesign of current medication administration work processes. Despite widespread adoption of these interventions, researchers have not systematically examined their impact on the underlying work process and resulting work flows for those expected to perform the work. Harried nurses on a busy and understaffed unit may perceive that the new technologies and processes are inefficient, unnecessary, or inconvenient. In response to such perceptions, nurses may try to get past real or perceived work process roadblocks by improvising how the work processes are completed. We refer to these improvised and informal changes in work processes as "workarounds."

There are only a few systematic research studies of healthcare professionals' workaround behaviors that address when and to what extent they occur and their impact on patient care quality and safety (McDonald, 2006; Wideman, Whittler, & Anderson, 2005). No attempt has been made to capture the extent to which workarounds may reduce patient safety. The key characteristics of workarounds are unclear, and measurement strategies have not been created to quantify and analyze workarounds. This study attempted to address this gap in the literature.

Background and Significance

With few exceptions, workarounds in healthcare has not been well defined conceptually or operationally (McDonald, 2006; Wideman et al., 2005). Ash and colleagues (2004) define

workarounds as "…clever methods for getting done what the system does not let you do easily" (p. 195). Similarly, Kobayashi, Fussell, Xiao, and Seagull (2005) define workarounds as "informal temporary practices for handling exceptions to normal workflow" (p. 1561). A more comprehensive definition comes from Morath and Turnbull (2005), who define workarounds as "…work patterns an individual or a group of individuals create in order to accomplish a crucial work goal within a system of dysfunctional work processes that prohibits the accomplishment of that goal or makes it difficult" (p. 52). Many of the elements of the various definitions are unclear. All the definitions include mention of an impediment in workflow, yet there is little known about how workers perceive such impediments. For example, research has not addressed whether intended safety blocks (e.g., alarms of medication infusion devices) are perceived as a necessary safety mechanism that must be used or as an impediment to work around. Finally, current definitions do little to conceptually differentiate workarounds from similar constructs, such as errors, mistakes, deviances, or shortcuts. As a result, reliable and valid measurement of workarounds has not ensued. Without a clear definition and measurement strategy, organizations are unable to detect and address workarounds, thus limiting patient safety initiatives.

Workarounds and Medication Errors

Although it has been suggested that workarounds can lead to medical errors, there has been little attempt to examine changes in risk of error or harm to patients associated with work process blocks and workarounds. In other words, no one has demonstrated the extent of the problem, nor has anyone explicitly determined the risk to patients from workarounds. This project is significant, as it takes an initial step toward filling this gap in our knowledge.

Intentional workflow blocks (i.e., safety checks) are common during medication administration. On one hand, workarounds may allow nurses to more efficiently provide patient care. On the other hand, workarounds of these blocks may make the system vulnerable to error and increase patient risk. Thus, workarounds may lead to problems with quality, particularly with the reliability of systems, because of the unpredictability associated with workarounds (Blick, 1997).

In summary, research suggests that workarounds occur and are theoretically linked to medication errors. However, there has been little research that has captured, in a comprehensive sense, the manner in which workarounds lead to potential patient risk in medication errors. This research is critical, as it could identify work flow changes that are necessary to improve patient safety and consistency in the provision of care.

Methods

Methods for Part I of the Project

We targeted three occupational groups (i.e., physicians, pharmacists and nurses) for study. The survey was distributed to 55 physicians (residents, attending physicians, and fellows), 96 pharmacists, and 60 nurses associated with the cardiac intensive care unit of an academic medical center in the US midwest. Thirty percent of physicians, 65 percent of pharmacists, and 29 percent of the nurses surveyed returned the survey.

Measurement and Analysis

Workarounds were assessed using the SITE (Situation, Individual, Task, and Effect; Charlton,

2002) approach. Using these categories, we developed open-ended questions targeted at instances when workflow blocks led to alteration of work processes. These questions probed the participants to consider a time when they had to alter work processes depicted in the process maps due to blocks. Five areas were included: the situation leading to the workaround; how the task would normally be completed versus how the participant carried out the task; the participant's feelings during the task; the events that followed the task; and how the task was communicated.

A research assistant transcribed SITE questions from the completed surveys. Following extensive training in the grounded theory approach (Glaser & Straus, 1967), transcripts were divided among a co-investigator and two research assistants for coding. Prior to any coding, each coder read through the transcripts in their entirety to familiarize themselves with the general nature of the responses. The researchers began with open coding, discerning general themes from the transcripts. These themes were higher-order themes, such as the nature of blocks leading to workarounds. Second, the researchers used axial coding, developing more specific themes and subthemes and exploring initial relationships among the themes. Third, each of the coders finalized the themes via a process of constant comparison (i.e., they compared the themes they developed in past coding with the new data and compared new themes that emerged with previously coded data). Fourth, the coders exchanged their sets of themes and compared their samples of transcripts and notes with the themes from the other coders. When applicable, they noted exceptions to the themes in the notes and transcripts and adjusted the themes. Finally, we integrated the coders' themes to develop a final set of themes.

Methods for Part II of the Project

Study Context

We conducted the research in the intensive care units (ICU) of four acute care hospitals. See Table 1 for the hospitals' descriptive statistics. We specifically chose different types of facilities (an academic medical center, two community hospitals – one with Nurse Magnet designation, and a rural hospital) to examine contrasts between different medication administration processes. Note: None of the facilities used bedside barcoding for medication administration.

Participants and Procedure

Fifty-eight ICU staff and supervisory nurses from four hospitals (individual facility participation is indicated in Table 1) participated. We interviewed only RNs involved in direct patient care at the time of their interview. Fifty participants (86%) were women. They had worked at their facilities for an average of 4.3 years and in their respective ICUs for an average of 2.6 years.

We conducted semi-structured interviews with each participant regarding the typical medication administration process and the barriers each encountered in carrying out this process. After the mention of a barrier, we asked follow-up questions to document the specific nature of the barrier, workarounds used, and subsequent patient risk. See the Appendix for a copy of the interview protocol. While conducting the interviews, a co-investigator and a graduate research assistant observed participants in the ICUs to verify the processes and workarounds identified through the interviews. While observing, they asked questions to clarify any discrepancies from

the interviews to shed additional light on the processes (see Table 1 for observation hours per facility).

Analysis

Our general aim was to document the nature and extent to which workarounds occur during medication administration in intensive care units (ICUs). Based on the interviews and observations and using an open-coding procedure, we developed process maps of the intended medication administration process. Representatives from each facility reviewed these and confirmed their accuracy. We then added work flow barriers to the process maps and compiled the reports of how these barriers were worked around. Again, representatives from each facility reviewed these maps and confirmed their accuracy. We then used axial coding to classify the links between the work flow barriers and associated workarounds or rework. This technique allowed us to examine general themes from the interviews and observations. We also examined the potential impact on patients for each barrier, drawn from the nurses' responses to the perceived impact on patients (see Figures 1-4).

Results

Results from Part I of the Project

Inspection of the data revealed a very interesting trend that has implications for the measurement of workarounds using the SITE technique. Although nurses and physicians returned the survey, a majority did not answer the open-ended SITE questions. Only five physicians and three nurses completed that section of the survey. As a result, we did not analyze those data. The pharmacists did complete the survey, and the coding of pharmacy responses to the workaround survey revealed a variety of important themes. In this section, we focus only on the pharmacist data.

Situations Leading to Workarounds

Computer issues (e.g., system down) were the leading cause of workarounds for pharmacists. Pharmacists could not look up information to fill prescriptions, which slowed their work. Other situations leading up to the workarounds included poor communication, staffing issues, time constraints, customer interruptions, and insurance problems.

Common Workarounds

Pharmacists would normally serve customers by filling prescriptions using their computer systems. However, when the computer systems were down, pharmacists had to stop work, locate patient files, hand write drug labels, and keep track of changes so they could update the computer system when it was again operating. Computer problems appeared to cause the greatest degree of deviation from the normal task. Other deviations included problems with technical support (availability of technical support staff), doctor's orders (clarification of orders or communication of changes), insurance (patients not having proper identification cards), and short staffing.

Approximately three quarters of the pharmacists came up with procedures for the workaround based on past experience, indicating that this is something they had dealt with previously. The remaining quarter either followed directions of others or called for technical support. When asked if they told anybody about the workaround, 68% said they did tell coworkers or supervisors, and 32% said they did not tell anyone.

Following the workaround, 41% of the pharmacists said that the problem was addressed.

Another 41% had to work harder to make up for problem by staying later or doing double the work the next day. Nine percent moved on in their work and did not correct the issue. The remaining 9% indicated that the workaround actually created additional problems.

Frequency of the Workarounds

When asked how often they had to alter their work processes, 32% said they engaged in workarounds daily. Twenty-seven percent did so weekly, 14% did so monthly, and 18% did so yearly. Nine percent of the pharmacists said they rarely, if ever, had to alter work processes.

Feelings During the Task

The workarounds described above led to the pharmacists feeling stressed, frustrated, and anxious. These comments were extraordinarily consistent in the surveys.

Results from Part II of the Project

The process maps, with barriers in the work process for each facility, appear in Figures 1-4. In Table 2, we describe the corresponding barriers and the nurses' responses to each barrier for each facility. Based on the analysis, a number of themes emerged. Generally, the workarounds and rework were associated with a variety of potentially negative patient outcomes. Most common among those (see Table 2) was a delay in the process, which opened up the possibility of other medication errors (misdose, etc.). This finding highlights the important potential negative impact of perceived work flow barriers and nurse responses to those barriers.

Workarounds and Rework are Highly Idiosyncratic

One of the clearest trends from the interviews and observations was the idiosyncratic nature of the workaround and rework processes, both across facilities and among nurses. Despite similar medication administration processes, we found the perceived barriers, rework processes, and workarounds varied. This finding implies that cultural norms develop regarding how certain barriers should be handled (e.g., in Hospital B, where there was a decentralized pharmacist on the unit, it was normative to talk with him/her first when a medication problem arose). It also suggests that, when such norms do not develop, nurses will develop their own solutions to the barriers (e.g., the many ways that nurses in Hospital A addressed wait times for filling orders).

An extension of this finding is that workarounds began as individual solutions to unique barriers in work flow but eventually become entrenched as part of the regular work process for some nurses. Though one could argue that this represents an attempt to improve the work process by introducing useful changes, such an argument is limited by the idiosyncrasy of the workarounds. We found that nurses tended to adopt unique work processes that they did not share with others on their unit. Therefore, even if it were an improvement on the process, it was limited to just that one nurse (unless others picked up on it coincidentally). Often, however, these processes would not necessarily be considered improvements and would raise the possibility of medication errors. For example, two nurses indicated that they regularly override the electronic medication dispensing system (Pxyis) in order to obtain morphine for immediate management of pain, later requesting morphine for their patients because they knew they were able to obtain it through Pxyis. These idiosyncratic processes make it difficult for individuals seeking to understand the

work process to develop more reliable processes for care (see also Tucker & Edmondson, 2002).

Fewer Barriers, Fewer Workarounds, Not Necessarily Safer

In the literature, workarounds typically are seen as negative events; they are often portrayed as something that should be avoided because of their potential negative safety implications. As our study suggests, barriers are necessary for workarounds to occur. However, a potential misconception is that a lack of barriers means a lack of workarounds, which leads to a safer process. That may not be the case. There was variability in how many barriers were observed across facilities. However, in some cases, the barriers were actually representative of steps taken to make the process safer (e.g., in Hospital D, paperwork requirements of the pharmacy). Although workarounds of these processes may introduce safety concerns, not having these barriers does not imply a safer process.

This finding represents a paradox in the quality improvement process of hospitals. On one hand, if they do not take steps to address safety concerns, safety outcomes suffer. On the other hand, because most interventions to make work processes safer involve adding steps to the work process and have associated perceived barriers and delays, the likelihood of workarounds and rework increases. As our study suggests, the increase in workarounds and rework is associated with potential negative patient outcomes.

Interaction with Pharmacy

Process maps in Figures 1-4 share a common pattern with regard to location of barriers in the process: Many were related to interactions with pharmacy (e.g., fax not received, waiting for pharmacy to fill order). Interestingly, the length of the wait varied dramatically (from 10 minutes to as many as 2 hours), but workarounds and rework tended to be initiated regardless of the amount of time. Rework seemed more common here than at other points in the process, including repeated calls and faxes to pharmacy. These issues seemed to appear more during daytime hours than night. According to the nurses, this was partially the result of lower patient demands during the day, a busier hospital (and thus, a busier pharmacy) during the day, and the increased likelihood that a new medication order would come during the day or would be changed by a physician during the day. In fact, largely because order changes were meant to address immediate concerns in ICU settings, order changes were far more likely to lead to barriers in the process and subsequent rework and workarounds.

Along these lines, having a truly decentralized pharmacist on the ICU appeared to address many of the workarounds. Hospitals A and B both had decentralized pharmacists associated with the ICUs studied. However, only Hospital B had the pharmacist located on the unit. On this unit, rather than working around barriers or engaging in rework, the response to a perceived barrier was typically to go ask the pharmacist for assistance. By making this processes normative, there was less need for rework and workarounds and less idiosyncrasy in the work processes.

One Workaround Leads to Another and Rework May Lead to Workarounds

In their review of workarounds in healthcare, Halbesleben et al. (2008) suggested that, in some

cases, by working around a barrier, one would create a need to work around new barriers. This finding was demonstrated in the present observations and interviews. We found a number of examples in which a workaround by a nurse led him or her to engage in additional workarounds. Examples of this frequently occurred when nurses worked around the process by "borrowing" another patient's medications. As one of the most potentially dangerous workarounds found in our interviews (because it bypasses numerous safety checks in the system), it also led to other downstream workarounds and rework, including extra work in charting and additional calls to pharmacy to explain what had been done for billing and dispensing purposes. These downstream workarounds and rework further increase the potential for a negative patient outcome.

Rework and checking also led to workarounds. This often was the result of a psychological process, whereby the nurses were willing to wait for a certain amount of time for the delay to play out but reached a point when they undertook a workaround to get the process moving. Frequently, in our interviews, we heard about situations in which repeated calls to pharmacy (rework) did not yield the expected outcome, so the nurses engaged in an override of the dispensing system in order to move the process forward.

Project Conclusions and Implications

Through observations and interviews with 58 nurses in six intensive care units within four hospitals, we documented rework and workarounds in response to perceived barriers in the medication administration process. Analysis of these work processes revealed common themes, such as the idiosyncratic nature of workarounds, common locations in the process when workarounds and rework occur, the number of barriers faced, and the downstream impact on work processes. Most importantly, our findings build on a growing literature that suggests that barriers in work flow and workarounds can lead to negative patient outcomes.

Implications for Theory and Research

This study is among the first, to our knowledge, to document examples of rework in healthcare settings. As noted in the introduction, authors have frequently expressed concern about rework and inefficiencies. This study highlights when this rework occurs, why it occurs, and, as we will elaborate below, how rework might be associated with workarounds and patient safety concerns.

Although extending the literature by focusing on workarounds in the traditional medication administration processes, our findings are consistent with previous work in this area. For example, Vogelsmeier et al. (2008) reported that the interface between the nursing home and pharmacy was the source of some of the workarounds they reported. Our findings are also consistent with Koppel et al.'s (2008) finding that medication administration processes are frequently the source of workarounds for nurses.

Implications for Practice

These findings also have some important implications for practicing healthcare professionals. As professionals seek mechanisms to improve patient safety, our study suggests that process mapping and analysis of the process maps may be useful. Unfortunately, though we have developed some general themes regarding rework and workarounds, our research underscores that professionals need to carefully examine the idiosyncratic nature of these workarounds,

because they emerge from various ways of organizing work processes. In one regard, the contribution of this article is the process of examining the workarounds more than the specific findings. We expect that the workarounds experienced in other settings would differ significantly; thus, it is the interview framework in Part II that offers the greatest contribution to future research on this topic. We found that the SITE method may not be feasible due to lack of response; however, the interview approach, paired with onsite observations, was effective in documenting workarounds.

The findings of this study also reinforce the potential application of lean manufacturing principles to healthcare work processes. If rework and workarounds are indeed the result of perceived barriers and inefficiencies, it suggests a need for continuous quality improvement initiatives that can address those inefficiencies, such as lean practices. By involving staff in "leaning out," the process should also likely lead to positive outcomes (cf., Halbesleben & Rathert, 2008).

One practice that this study does support is decentralized pharmacy. This practice has already been associated with lower medical errors (Bond, Raehl, & Franke, 2001); our study reinforces why this might be the case. It seems that, when decentralized pharmacists exist for ICUs, nurses are less likely to engage in workarounds. This finding seems particularly true when the decentralized pharmacist is physically located on the unit. This result may be due to the availability of the pharmacist to address problems and answer questions, in effect, building up positive communication between nurses and pharmacy. It may also occur due to the greater likelihood of the pharmacist observing and correcting potentially dangerous medication practices (e.g., swapping patients' medications). Clearly, additional research is needed to verify these causes.

Limitations

One potential concern about the present study is the sample size and representativeness of the samples for both parts. The sampling strategy used in this study was *purposive*, in that participants are specifically targeted for their characteristics (e.g., occupation, experience, etc.; see Russell & Gregory, 2003). We were able to achieve the suggested grounded theory study sample size (e.g., Morse, 1994, who recommended approximately 30 to 50 interviews). Qualitative research is based on the richness of the data and the representation of the participants; as such, traditional notions of statistical power (and power analysis) do not apply (Sandelowski, 1995). The sample size was deemed acceptable when no new themes emerged from the data (the data had reached a saturation point; see Hunter, Hari, Egbu, & Kelly, 2005).

List of Publications and Products

Halbesleben, J. R. B., Savage, G. T., Wakefield, D. S., & Wakefield, B. J. (2009, August 10).

> Rework and Workarounds in Medication Administration Processes: Implications for Patient Safety Paper presented at the annual meeting of the Academy of Management, Chicago, IL. (This paper has also been submitted for publication.)

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Table 1

Summary of Facilities Included in the Study

Hospital	Context	Type of ICU(s)	Interviews Completed (% of ICU Nursing Staff)	ICU Bed Size (of ICUs Studied)	Observation Hours
A	Academic Medical Center	Cardiac ICU	20 (33%)	18	40
B	Community Hospital (Magnet Status)	Medical/Surgical ICU & Cardiac ICU	20 (51%)	18	20
C	Community Hospital	Critical Care Unit & Surgical ICU	14 (65%)	20	20
D	Rural Hospital	Medical/Surgical ICU	4 (57%)	4	20

Table 2

Description of Part II Study Barriers, Nurse Response to Barriers, and Potential Impact on Patients (Nurse response coded W=Workaround, R=Rework, Checking & Other Work. Potential patient impact coded P=Wrong Patient; T=Wrong Time; R=Wrong Route; M=Wrong Medication (Drug); D=Wrong Dose).

Hospital A

Barrier #	Description	Nurses Response to "Unacceptable Delays"	Frequency	Potential Patient Impact
1	New order not communicated by physician	R - Frequent checking of system	Infrequent	T - Extra time to administer
2	Fax not received by pharmacy	R- Call pharmacy R - Resend fax	Infrequent	T - Extra time to administer
3	Waiting on pharmacy to deliver order	R -Calls to pharmacy, R - Calls to specific pharmacist W - Override in Pyxis W - Taking from another patient's stock W - Change order to med that can be obtained via override (e.g., pain meds) W - Chart at earlier time than actually given W - Call to other ICU to check if they have stock	Multiple Times Daily for barrier Frequency of workaround dependent on nurse (e.g., each had preferred workaround) Taking from another pt – once every few weeks Overrides – at least once per shift Calling other ICU – once per month	T - Extra time to administer M,D - Misdose (e.g., antibiotics) P,M,D,T,R - Increased likelihood of medication error Reduced Patient Satisfaction
4	Order arrival not communicated to nurse	R - Frequent checking of possible locations	Infrequent	T - Extra time to administer
5	Order placed in wrong cabinet	R - Frequent checking of possible locations	Once per week	T - Extra time to administer P,M,D,T,R - Increased likelihood of medication error
6	Medication arrives as ordered, but patient cannot take medication as ordered	R - Call to pharmacy for change	Infrequent	T - Extra time to administer

Hospital B

Barrier #	Description	Nurses Response to "Unacceptable Delays"	Frequency	Potential Patient Impact
1	Unit clerk not available to enter order	R - Nurse enters order	Infrequent – only very busy times	T - Extra time to administer
2	Order changed in chart, not directly communicated to nurse	R - Repeated checking of chart	Once per week	T - Extra time, M,D - Potential missed medication
3	Time – waiting on pharmacy	R - Talk to decentralized pharmacist R - Calls to pharmacy W - Override in Pyxis W - Take from another patient's medications	Infrequent – only very busy times	T - Extra time to administer P,M,D,T,R - Increased likelihood of medication error

Hospital C

Barrier #	Description	Nurses Response to "Unacceptable Delays"	Frequency	Potential Patient Impact
1	Unable to understand order	R - Call physician R - Ask opinion of other nurses, clerk, pharmacy	Very infrequent – three times per year	T - Extra time to administer P,M,D,T,R - Increased likelihood of medication error
2	Regular medication not charted	R - Ask patient if medication was taken R - Call previous nurse	Almost daily	T - Extra time to administer P,M,D,T,R - Increased likelihood of medication error
3	Physician not available for clarification	R - Wait W - Interpret based on previous medications (acting without physician order)	Once per week	T - Extra time to administer P,M,D,T,R - Increased likelihood of medication error
5	Unit clerk not available to enter order	R - Nurse enters order	Infrequent – only very busy times	T - Extra time to administer
4	Fax machine not functioning	R - Call to pharmacy	Very infrequent	T - Extra time to administer
6	Time – waiting on pharmacy	R - Calls to pharmacy W - Override in Pyxis	Multiple times daily	T - Extra time to administer

Barrier #	Description	Nurses Response to "Unacceptable Delays"	Frequency	Potential Patient Impact
7	Medication not where expected/not in drawer	R - Check other possible places R - Calls to pharmacy R - Call to decentralized pharmacist W - Override in Pyxis W - Take from another patient's medications	Once per day	T - Extra time to administer P,M,D,T,R - Increased likelihood of medication error
8	Medication not in Pyxis	R - Calls to pharmacy W - Take from another patient's medications	Very infrequent	T - Extra time to administer P,M,D,T,R - Increased likelihood of medication error
9	Medication arrives as ordered, but patient cannot take medication as ordered	R - Call to physician	Very infrequent	T - Extra time to administer

Hospital D

Barrier #	Description	Nurses Response to "Unacceptable Delays"	Frequency	Potential Patient Impact
1	Interruption while charting	W - Skip charting, go back and chart later	50% of time	T,M,D - Charting errors, P,M,D,T,R - omissions
2	Pharmacy paperwork requirements during codes	R - Call to pharmacy W - Take medication from code cart	Half of time (when codes occur)	P,M,D,T,R - Increased risk of wrong medication, wrong dose
3	Medication not where expected	R - Calls to pharmacy R - Call to Nurse Supervisor (night)	Infrequent	T - Extra time to administer

Appendix

Interview Protocol

1. Walk me through the medication administration process, from the physician order to the bedside. Highlight the points in the process that don't work as they should and the solutions you have come up with the address the problems.

   [probe to clarify problems/solutions]

   For each problem/solution, ask how frequently it occurs.

2. As you are addressing the problems that come up in medication administration, what impact is it having on you?

3. What impact is it having on the patients and their care?

   [probe to expand on impact or clarify – e.g., do they notice when problems are occurring?]

Figure 1.
Hospital A Medication Administration Process Map with Barriers

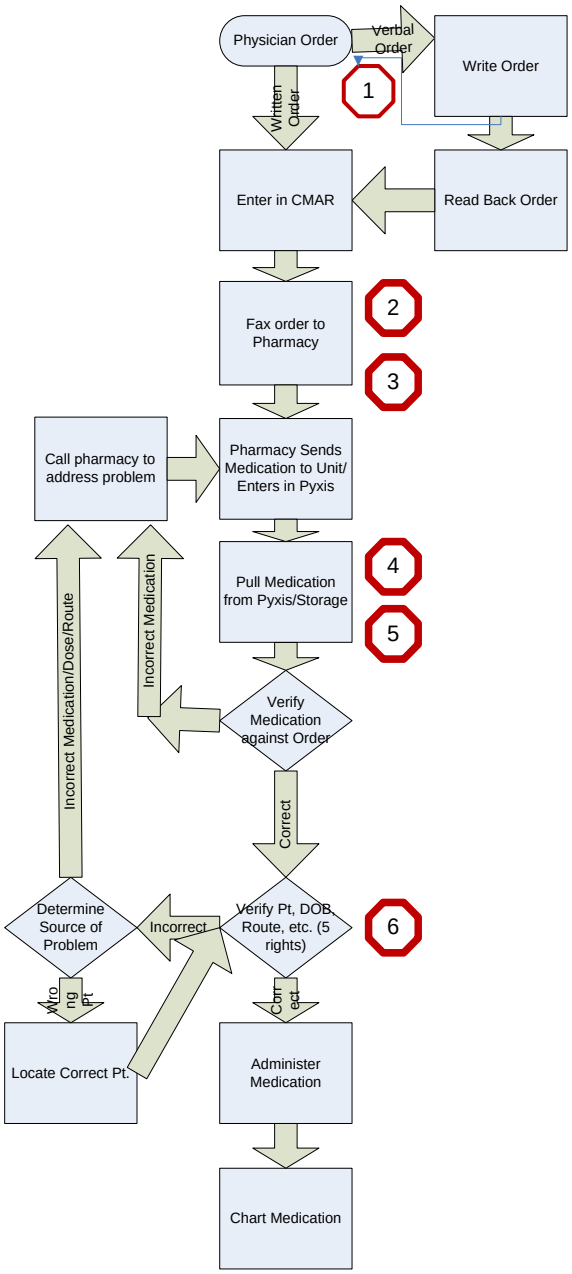

Figure 2.

Hospital B Medication Administration Process Map with Barriers

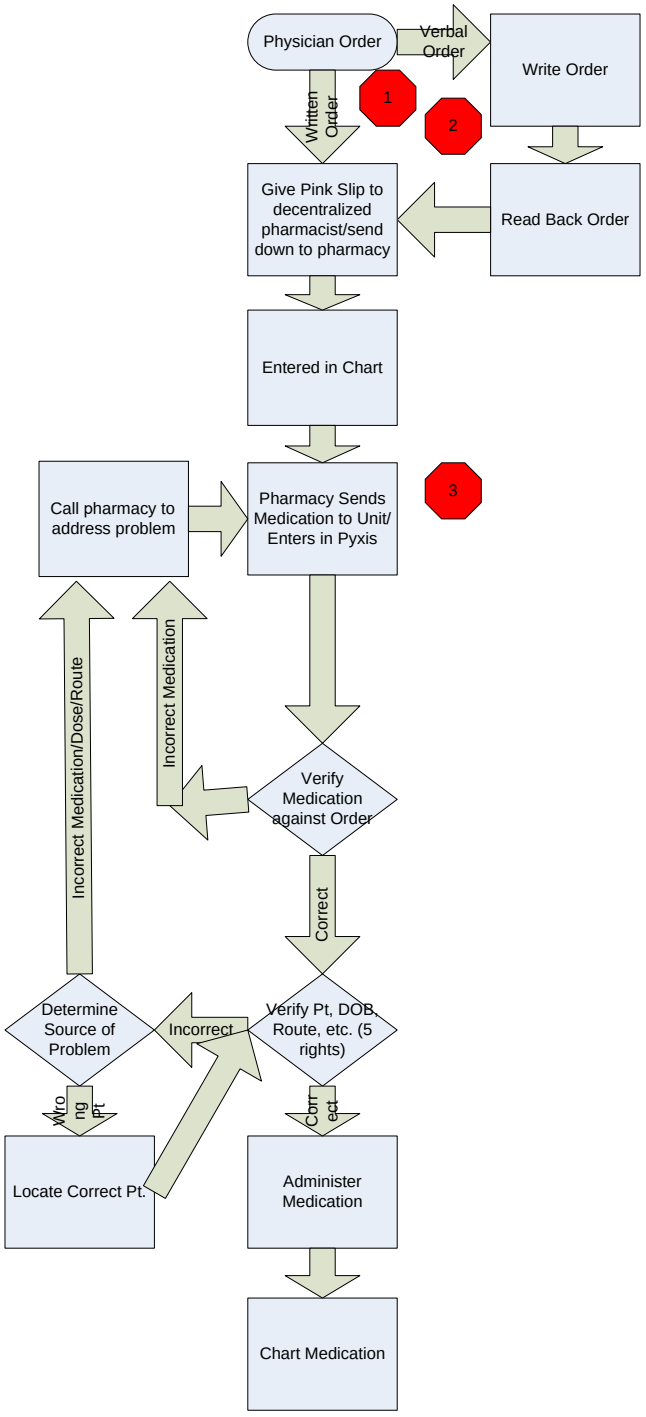

Figure 3.

Hospital C Medication Administration Process Map with Barriers

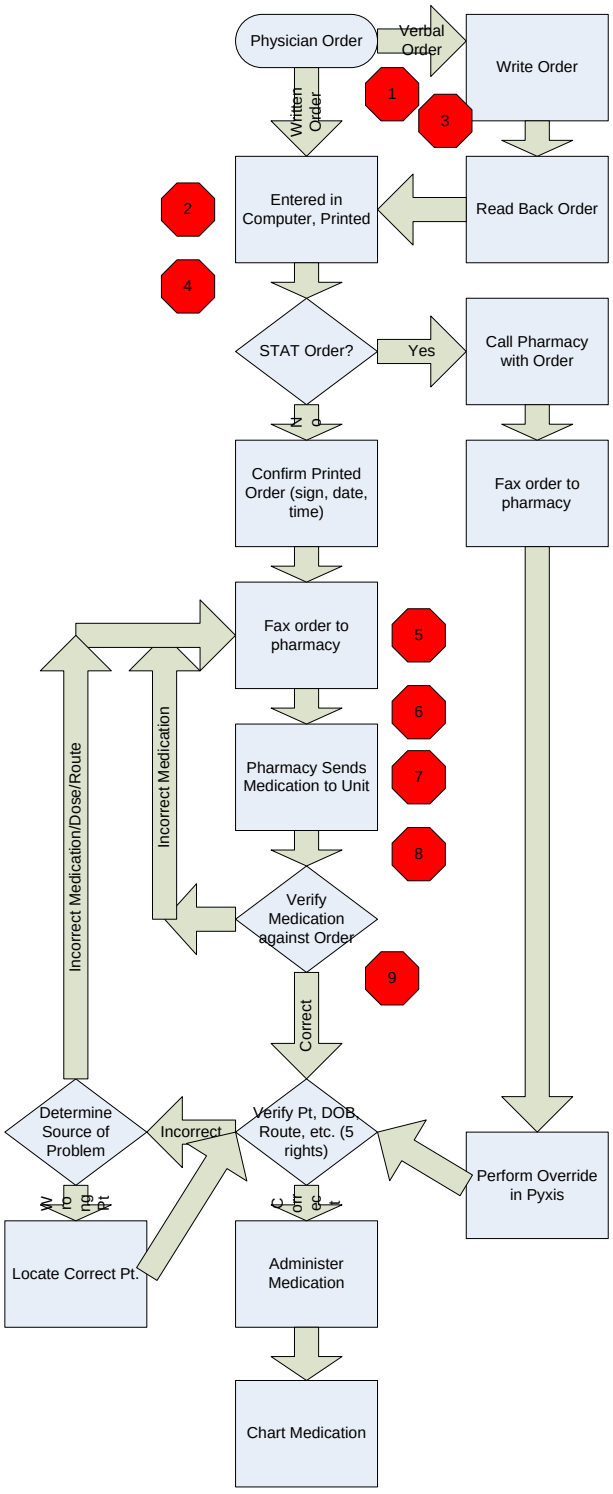

Figure 4.

Hospital D Medication Administration Process Map with Barriers