The Sterile Cockpit: An Effective Approach to Reducing Medication Errors?

How one nursing unit tried to limit interruptions during medication administration by adapting the aviation industry rule.

Medication errors occur all too often, and the risks they pose to patients are unacceptable. According to a 2006 Institute of Medicine report, at least 1.5 million preventable medication-related adverse events occur in the United States every year, but the true number could be much higher. The same report estimates that each event increases hospital costs by $5,857, for an annual cost of $3.5 billion in 2006 dollars. The report further notes that this figure doesn't take into account out-of-hospital costs, lost earnings, or any compensation for pain and suffering. Because medication administration is an important part of the nurse’s role, medication error prevention should be a primary focus of nursing care delivery and quality improvement.

In 2010 our unit, a 35-bed pulmonary–medical unit in a large academic medical center, consistently had the highest number of reported medication errors hospital-wide—as many as 21 errors in the third quarter alone. During the same period, the unit with the second highest number of errors had six. We couldn’t identify specific factors such as differences in staffing patterns or greater medication use that would account for our larger number of errors. Regardless of the reason, the error rate was unacceptable and to improve patient safety we needed to decrease it.

A group of bedside nurses (including the three of us) formed a committee to explore ways to reduce medication errors. We gathered unit-specific information from incident reports and staff nurse interviews on factors that might have contributed to the errors. Suspecting that interruptions during medication administration might play an important role, we gathered literature on causes of medication errors and strategies to reduce them. Several recent studies indicated that interruptions and distractions during medication administration are a major contributor to medication errors, so we decided to focus our efforts on reducing such interruptions. While we knew it wasn’t feasible to eliminate interruptions completely—nurses must respond expeditiously to changes in patients’ clinical status and to emergencies when they occur—many interruptions for routine matters can wait until medication administration is done.

Most efforts to decrease interruptions documented in the literature were adaptations of the “sterile cockpit” rule, a commercial aviation industry innovation that forbids nonessential conversation and activity among flight crew members during taxiing, takeoff, and landing. The Federal Aviation Authority instituted the rule in 1981 after the National Transportation Safety Board, the agency charged with investigating plane crashes, determined that these conversations played an important role in aviation accidents.

We decided to explore how nursing units have adapted the sterile cockpit rule, evaluate the efficacy of their strategies in reducing medication errors, and apply the best strategies on our own unit.

LITERATURE REVIEW

The National Coordinating Council for Medication Error Reporting and Prevention defines a medication error as “any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer.” Here we focus on accidental medication errors committed by bedside nurses and caused by interruptions during in-patient medication administration.

James Reason, a leading researcher on human error, distinguishes between two approaches to its analysis and management: the person approach and the system approach. The former treats errors as aberrations and blames individuals for their lapses and mistakes; the latter accepts the inevitability of error, focuses on the conditions under which people work, and attempts to build defenses that prevent errors and minimize the consequences of those that do occur. In his pioneering work on the system approach, Reason declared: “We cannot change the human condition, but we can change the conditions under which humans work.” According to this approach, “When an adverse event occurs, the important issue is not who blundered, but how and why the defences failed.”

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Reason attributes gaps in defenses to two factors: active failures and latent conditions; errors are often a result of a combination of both. In the health care setting, active failures are caused by a provider’s direct action on a patient; latent conditions are systemic shortcomings that are indirect causes of error. Although active failures are often considered the immediate cause of an error, Reason emphasizes that most errors are attributable to latent conditions. A nurse who miscalculates a dose of furosemide because of an interruption and administers the incorrect dose commits an active failure. The allowance of repeated interruptions during medication administration is the latent condition that makes active failure more likely.

Results of a study by Bailey and Konstan show that participants committed twice as many errors when interrupted than when there were no interruptions (22% versus 11%, respectively). Interruptions also increased the time to complete a task by as much as 27%.

Although the number of medication errors decreased on our unit after our interventions, the largest reduction occurred after the introduction of bedside rounding.

They also noted that “the disruptive effect of interruptions on completion time tends to increase with the difficulty of the primary task,” a finding that seems particularly relevant to a complex task such as medication administration.

In a 19-month multisite observational study on hospital units in Australia, Westbrook and colleagues examined the effect of interruptions on the rates of procedural failure (an omission of a required step in the administration of medication, such as checking the medication label or the patient’s identification) and clinical error (involving an incorrect drug, dose, or route). More than 4,200 administrations were observed and interruptions occurred in more than half (53.1%). Each interruption was associated with a 12.1% increase in mean procedural failures and a 12.7% increase in mean clinical errors per medication administration. The risk of committing a major medication error (rated 3 or higher on a five-point severity scale) in a single medication administration doubled from 2.3% with no interruptions to 4.7% with four interruptions. The results of this study clearly suggest that, while some medication errors occur even without interruptions, reducing the number of interruptions per administration can reduce both the frequency and severity of errors.

Jones and Treiber conducted a two-part survey of nurses to determine how many had committed medication errors and to examine their perceptions of how and why medication errors occurred. In the first part, more than three-quarters (78%) of a randomly selected sample of RNs from various disciplines (N = 202) admitted making such errors and attributed them to a variety of contributing factors provided in the questionnaire. In the second part, those who made medication errors responded to a series of open-ended questions, and additional contributing factors emerged from their answers. Among these, interruptions and distractions were identified as important. One respondent wrote: “We are always in a hurry at the hospital, too many distractions (phone ringing, people looking for you, alarms ringing, doctors calling).”

Despite the known risks, interruptions continue and medication errors persist. According to a Harvard Business Review report on an effort to make medica-
been a factor contributing to the interruptions. In a smaller, separate study, McGillis Hall and colleagues found similar results in six medical and surgical units in three acute care teaching hospitals in Toronto. Again, the actions of health care team members, including physicians, respiratory therapists, and other nurses, accounted for more than half (54.2%) of 1,687 observed interruptions of nursing care.14

Interventions based on the sterile cockpit rule. Hospitals have used a variety of strategies in applying the sterile cockpit rule to medication administration. One adult ICU designated a “no-interruption zone” around medication carts by affixing strips of red duct tape to the floor.7 Nurses were not to be interrupted when they were standing inside the red tape lines. This intervention decreased interruptions during medication administration by 40.9% in a three-week period and, anecdotally, nurses reported that the no-interruption zones increased their awareness of medication safety. The researchers did not test whether the results were sustainable over time.

A medical–surgical unit at Johns Hopkins Hospital in Baltimore, Maryland, used a different strategy to reduce interruptions during medication administration: nurses wore yellow safety vests to alert other members of the medical team that medication administration was in progress and the nurse conducting it should not be disturbed.6 The pilot project also limited to three the number of nurses allowed in the medication room simultaneously and forbade the interruption of medication administration to respond to telephone calls and call bells. The unit had a 52% reduction in interruptions after piloting the project for four days. However, the hospital discontinued the project; logistical difficulties (getting staff members to wear the vests at the right times and respond appropriately to those wearing them) led to staff resistance to the strategy. This was one of the first indications we had that, despite general enthusiasm for the sterile cockpit concept, forcing nurses to focus solely on one task, such as medication administration, conflicts with a nursing culture that values nurses’ flexibility to respond to the full range of clinical responsibilities whenever the need arises. Nurses’ other responsibilities cannot be turned off when medication administration occurs.

Nurses at a hospital in South Texas undertook a process improvement project that involved the use of a medication administration checklist and “Do Not Disturb” signs posted above automated medication dispensing machines and medication carts.8 Nurses’ adherence to the checklist was mixed, but one week after the signs were placed the quality improvement team found an overall reduction in the “severity” of distractions that nurses experienced during medication administration. (Nurses rated severity on a 0-to-10 scale that was, in fact, a measure of the frequency of distractions they experienced, with 0 representing “not often” and 10 “extremely often.”) The greatest reductions were in distractions caused by other nurses (the mean score dropped from 5.6 to 2.9). There was little change in the severity of distractions from physicians and other providers (the mean score dropped from 6.8 to 5.9), which presented a challenge in reducing overall distractions. Again, the study period was limited to one week, and it’s uncertain if the reduction was sustained.

**Figure 1.** The red warning sign created by the Medication Quiet Time committee indicates that medication administration is in progress.
A permissive attitude toward interruptions is deeply ingrained in hospital culture.

We decided to post two octagonal red signs on the sides of each medication cart; the signs looked like stop signs with the following lines of text: “STOP/medication administration in progress/please do not disturb nurse” (see Figure 1). Because the signs were posted on each side of the medication carts, they could be seen by anyone who approached from either side. We were concerned that staff members and others might eventually become used to a permanent sign, so we proposed using removable signs that would be displayed on the carts only when medications were being administered.

The committee recruited patient care technicians (PCTs) and unit secretaries to play a role in reducing interruptions during medication administration. We asked unit secretaries to evaluate telephone callers’ requests and route calls to nurses only when necessary, rather than interrupting them for every call. For example, laboratory technicians often called the unit and asked to speak with a particular nurse, and when the nurse answered, the technician would merely ask for a physician’s pager number—information the unit secretary could easily have provided. When family members called during medication administration, the unit secretary would explain why the nurse could not be interrupted and ask the caller to leave a message. PCTs made an extra effort to help answer call bells and meet basic patient care needs while nurses were administering medications.

Bedside rounding. We decided to initiate change-of-shift bedside rounding to identify and address basic patient needs at the start of each shift, thereby forestalling common causes of interruptions. During bedside rounds, the outgoing and incoming nurses would check each patient’s identification bracelet, mental status, and IV catheter sites and ask whether the patient had any questions or concerns. They would also verify that all fluids and medications were infusing according to the physicians’ orders. Bedside rounds also allowed us to catch in a timely fashion any errors related to incorrect IV fluids or omitted medications.

Staff feedback. Before implementing the proposed changes, we obtained feedback from the staff. Nurses were asked to complete an anonymous paper survey rating the importance of various contributors to medication errors using a three-point Likert-type scale. They were also asked to rate their openness to various interventions, such as wearing a vest or posting stop signs, as ways to alert others that medication Quiet Time was in effect.

We had an 80% response rate to the survey (n = 36). Results showed that nurses thought interruptions during medication administration were the greatest cause of medication errors. The stop signs were the most popular suggested intervention and wearing vests the least popular. Along with the survey, we distributed Medication Quiet Time guidelines and asked the nurses for feedback. Most nurses were receptive to the proposed changes, and only a few made minor suggestions.

IMPLEMENTING MEDICATION QUIET TIME

The committee hosted a breakfast to introduce the program to all staff nurses, PCTs, and unit secretaries. We reviewed the Medication Quiet Time guidelines, placing particular emphasis on the roles and responsibilities of each staff member. We encouraged the staff to share their thoughts and concerns related to the changes. A number of nurses were doubtful about the potential effectiveness of the program; however, nearly all the staff recognized the importance of the effort and expressed a willingness to embrace the changes.
Most concerns came from PCTs who felt that their workload would increase unfairly because they would be the only staff members available to respond to basic patient needs during medication administration. We acknowledged their concerns and emphasized the overall benefits. We stressed that while there might be an initial increase in their workload, medication administration should become more streamlined and shorter in duration if nurses were interrupted less often. This would benefit the patients, nurses, and PCTs.

Because we were cognizant that many interruptions come from other members of the health care team, we made an effort to share our project and its rationale with as many people as possible, both on and off the unit. We presented our plan at the hospital’s monthly quality and performance improvement meeting, the institution-wide medication safety committee meeting, the weekly meeting of nurse educators, and the medicine service interdisciplinary committee meeting. We were able to reach at least 100 staff members, including physicians, nurses, pharmacists, PCTs, and nurse educators.

**Barriers to change.** We encountered several challenges in implementing bedside rounding and Medication Quiet Time. The biggest challenge to bedside rounding was reluctance of some staff to participate. Some nurses didn’t see the benefit of bedside rounding if they were already familiar with patients after caring for them for several days. And many nurses, especially those who were to return in 12 hours for their next shift, were eager to finish report as quickly as possible.

Most of the problems we encountered were related to a lack of adherence to the stop sign protocol. Initially, nurses had to be reminded to display the stop signs during medication administration and to remove them afterward. Even when the signs were displayed appropriately, nursing staff and other health care providers often ignored them. Nurses also found it difficult to refrain from responding immediately to patients’ and family members’ requests, especially when the latter were standing nearby, trying to get their attention. Furthermore, physicians continued to interrupt nurses with nonurgent matters. This was compounded by the fact that some nurses kept the signs displayed while they were documenting or reviewing laboratory results or after they had stepped away from their carts. Thus, the stop signs did not consistently indicate that medication administration was in progress, and it’s possible that as a consequence, staff members became inattentive to them.

**Responding to challenges.** To enhance awareness of Medication Quiet Time among family members and other visitors, we posted permanent instructional signs at the entrance to the unit and at the nurses’ station. The signs included an illustration of the stop sign and the hours that Medication Quiet Time would be in effect. To reinforce the program among staff members, we created a bulletin board describing the intervention and included dialogue that staff could use to prevent interruptions. Nurses were encouraged to tell family members and other staff: “I am in the middle of administering medications right now. Can I come back to you in a few minutes?” Nursing leadership rounded on the unit before and after Medication Quiet Times to remind nurses to post and then to remove the signs.

Additional challenges arose. The PCTs continued to feel that their workload had increased unfairly. Many voiced frustration that they hadn’t been included in the survey and felt their concerns weren’t addressed before the project started. The unit secretaries continued to forward nonurgent calls to nurses that could have been handled at a later time.

To address these issues, nursing leadership met with the unit secretaries and the PCTs to discuss their concerns and reinforce the importance of the program. Nursing leadership rounded on each patient during the 10 a.m. Medication Quiet Time, which was the busiest, to assist with basic patient needs and help with responding to call bells, delivering medications, and answering the phone so that nurses could focus on medication administration. Unit secretaries were given the responsibility of posting a stop sign at the entrance to the unit at the beginning of each Medication Quiet Time. This gave them a sense of belonging to the team and made them more mindful of when Medication Quiet Time was in effect.

**Table 1.** Quarterly Rates of Medication Errors on the Pulmonary–Medical Unit

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Medications Given</th>
<th>Medication Errors</th>
<th>Medication Errors, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>2Q10</td>
<td>46,727</td>
<td>11</td>
<td>0.02</td>
</tr>
<tr>
<td>3Q10</td>
<td>48,755</td>
<td>21</td>
<td>0.04</td>
</tr>
<tr>
<td>4Q10</td>
<td>46,215</td>
<td>10</td>
<td>0.02</td>
</tr>
<tr>
<td>Year 2010</td>
<td>141,697</td>
<td>42</td>
<td>0.03</td>
</tr>
<tr>
<td>1Q11</td>
<td>45,877</td>
<td>9</td>
<td>0.02</td>
</tr>
<tr>
<td>2Q11</td>
<td>45,564</td>
<td>3</td>
<td>0.01</td>
</tr>
<tr>
<td>3Q11</td>
<td>43,311</td>
<td>3</td>
<td>0.01</td>
</tr>
<tr>
<td>4Q11</td>
<td>45,986</td>
<td>8</td>
<td>0.02</td>
</tr>
<tr>
<td>Year 2011</td>
<td>180,738</td>
<td>23</td>
<td>0.01</td>
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</tbody>
</table>
OUTCOMES
We began bedside rounding in November 2010 while still gathering information and getting feedback from staff. In the first three months (October through December 2010), the number of medication errors on the unit dropped from 21 to 10 (see Table 1). From January through March 2011, the number decreased to nine. We implemented Medication Quiet Time in March 2011, and the medication error rate in April through June dropped to three.

Two months after implementing Medication Quiet Time, we distributed the first follow-up survey to our staff of 42 nurses to evaluate the program's effectiveness. Thirty-two nurses responded. Twenty-one of the respondents (66%) reported no change in the frequency of interruptions since Medication Quiet Time was implemented and 10 (31%) reported a reduction (one respondent neglected to respond to the question). When asked what factors prevented the stop signs and quiet times from being more effective, nurses most often chose: “Staff do not respect the signs.” Nurses continued to rate phone calls and distractions caused by family members and other staff members as significant contributors to interruptions.

We also held a staff meeting to discuss Medication Quiet Time and get additional feedback, and encouraged all nurses, PCTs, and unit secretaries to attend. The majority of staff members still felt the initiative was a good idea, but unit secretaries and PCTs noted that nurses often left stop signs on the carts when medication administration wasn’t in progress, making it difficult to ascertain when Medication Quiet Time was in effect. Nurses said physicians often interrupted nurses to ask where supplies for a particular procedure were kept, and supply closets were poorly organized, compounding this problem. For instance, supplies needed to draw blood were located in three different closets, each with a different access code. Nurses reported that they often found it easier to stop what they were doing and get supplies for the physician rather than explain how to obtain them.

Refining the program. We put several strategies in place to address the problems identified. All nurses and PCTs were encouraged to remind their peers to remove signs at the end of Medication Quiet Time. Nursing leadership coached individual staff members to maintain adherence. We reorganized the closets, grouping supplies by procedure (for example, storing all blood draw supplies together) and posted a list of the closet’s contents on each door to make supplies easier to locate. Many physicians noted the improvement and started making an effort to gather their own supplies.

Reevaluating the interventions. After allowing several months for the interventions to take hold, we administered a second follow-up survey in November and December of 2011. Forty of 46 nurses responded. Nine of those nurses (22.5%) were hired after the Medication Quiet Time project was already under way. Of the 31 nurses on staff when we instituted Medication Quiet Time, 42% (n = 13) reported that interruptions during medication administration had decreased since the beginning of the project. The remaining 58% (n = 18) reported no change in the frequency of interruptions. Seventy-five percent of all respondents (n = 30) rated the severity of interruptions at 5 or higher on a 0-to-10 scale. As a result of these findings, we discontinued the use of the stop signs.

DISCUSSION
Although the number of medication errors decreased on our unit after our interventions, the largest reduction occurred after the introduction of bedside rounding and before the implementation of Medication Quiet Time. However, the unit did maintain the small reduction in errors observed between the two follow-up surveys (three errors each in the second and third quarters of 2011, April through September). We believe bedside rounding contributed to the reduction in medication errors by increasing accountability. Knowing that someone would be checking IV fluids and medications at the change of shift, nurses probably made an extra effort to double-check these items before bedside rounds occurred.

Another possible explanation is that errors discovered during bedside rounds were brought to the attention of the nurses who committed them, corrected immediately, and then not reported as errors. For example, during bedside rounds, an incoming nurse might discover that the outgoing nurse forgot to unclamp tubing to allow an IV antibiotic to infuse; she would then unclamp the tubing and infuse the medication. Although such an error should be reported, nurses may feel that it doesn’t warrant an incident report because it was fixed before any adverse event occurred. In our initial 2010 survey, half of the respondents (n = 18) admitted to not reporting a medication error they had discovered, and several cited having spoken with the other nurse directly or thinking that the error didn’t cause harm as reasons for not reporting. This is consistent with Mayo and Duncan’s finding that roughly half of nurses (52.9%) believe errors that aren’t serious or don’t cause harm don’t need to be reported.15 The self-reporting system that our hospital and most others use to track medication errors is subject to such reporting bias.

A flawed approach? Our outcomes raise questions about the effectiveness of using an adaptation of the sterile cockpit rule to decrease interruptions during
medication administration. Even after addressing the issues raised by nurses on the first follow-up survey, there was little improvement in interruptions during medication administration; the majority of nurses still reported no change in the frequency of interruptions and three-quarters rated interruptions at 5 or greater on a 0-to-10 scale (with 10 being “constantly interrupted”).

Why is the sterile cockpit approach more challenging in the health care setting than it appears to be in the airline industry? The two environments are different in many ways. While the pilot and copilot are physically isolated in the cockpit, there are other communication channels—between cockpit, flight crew, and air traffic controllers, for example—that also must be managed. Nurses administering medications don’t do so in a physically isolated environment and may not appear to others to be engaged in a critical task that requires their full attention. The procedure occurs at constantly changing times and locations, and many different people, including physicians, other patients, and family members, routinely seek information or assistance from nurses. Eighty-three percent (n = 33) of respondents to our second follow-up survey stated that interruptions from family members who ignored the stop signs were a key factor that made Medication Quiet Time less effective. On a unit where length of stay ranges from one day to several months, new patients and family members are constantly arriving, making it difficult to ensure that all are aware of Medication Quiet Time. Furthermore, recent emphasis on patient- and family-centered care encourages nurses to address the needs of a family member even during medication administration.

Although the sterile cockpit approach has garnered much attention as a strategy for decreasing interruptions during medication administration, our results are not unprecedented. The yellow safety vests nurses wore at Johns Hopkins were correlated with a reduction in interruptions, yet they were poorly received by the nurses. Our speculation is that the vests signify unavailability, which doesn’t mesh well with a nursing culture that values flexibility and availability. The “Do Not Disturb” signs posted by Pape and colleagues also seemed to decrease interruptions in general but had little effect on interruptions by physicians and other providers (who, research tells us, account for the majority of interruptions). The no-interruption zone created by Anthony and colleagues appeared to be the most successful of the three strategies we reviewed. However, even these researchers recognized an inability to prevent interruptions by alarms, pagers, and other devices, and they did not resolve the question of how to conduct necessary medication-related conversations safely in a no-interruption zone. Had their study continued beyond three weeks, these issues might have become more of a problem. Furthermore, Anthony and colleagues’ study was conducted in an ICU with lower nurse–patient ratios than a typical medical–surgical unit. It’s possible that nurses on units with a lower nurse–patient ratio experience fewer demands for their attention from patients and family members during medication administration, but more research would be needed to confirm this hypothesis.

The sterile cockpit approach has been applied to other clinical areas, such as the operating room, with more success. Wadhera and colleagues developed a standardized protocol for communication between perfusionists and surgeons to improve communication in eight critical stages of cardiopulmonary bypass surgery. The protocol included scripts for each member to follow and forbade nonessential communication during these critical stages to reduce the frequency of events that were potential sources of error, such as ambiguous or repeated communications, miscues, and failures to give confirmatory callbacks during surgery. The researchers found that communication breakdowns between surgeons and perfusionists decreased from 11.5 to 7.3 incidents per case after the intervention. However, the researchers also noted that, while it’s appropriate for the aviation industry to limit communications during critical time periods such as take-off and landing, critical events can occur at any time in medical settings. Like the medical–surgical unit, the operating room differs from the airline cockpit in this regard. Therefore, Wadhera and colleagues’ adaptation of the sterile cockpit concept focused on defined events that had high error potential in their operating room and applied the critical-event protocol whenever such an event took place. This is similar to what we attempted to accomplish with Medication Quiet Time. However, medication administration does not take place in a single location with consistent players, as does communication in the operating room.

Implications. The limitations of the sterile cockpit approach raises questions about its value as a strategy for decreasing interruptions during medication administration on medical–surgical nursing units. Any
strategy aimed at reducing errors and increasing patient safety must consider nursing culture. Nurses accept interruptions as a necessary part of doing their job because they value being constantly available to meet patients’ needs. For example, in a study examining the complexity of nurses’ work in acute care settings, Ebright and colleagues identified interruptions as one of several patterns that are detrimental to nurses’ focus in clinical situations but which nurses often accept as routine. Although complete elimination of interruptions is unlikely, nurses and other hospital staff need to appreciate the complexity of medication administration and the cognitive demands it makes on nurses. Interruptions during this critical task should no longer be tolerated.

The Medication Quiet Time project highlights the challenges of implementing a new evidence-based practice in the nursing workplace that originates in a nonnursing field. Future attempts to reduce interruptions during medication administration must be adapted to the unique challenges of the nursing unit, such as patients’ constantly changing needs and the unexpected emergencies that require nurses’ immediate attention.

Despite our setbacks, it’s noteworthy that the project sparked the beginning of visible changes in unit culture concerning medication administration. As one senior physician said, “I have been a doctor for 35 years, and it never once occurred to me until today that a nurse administering medications is doing something that requires concentration and should not be interrupted.” The fact that this discovery came as such a shock to this seasoned physician is evidence that a permissive attitude toward interruptions is deeply ingrained in hospital culture.

**Going forward.** A multifactorial approach that addresses the specific challenges of a busy nursing unit is needed to successfully eliminate medication errors. Since our last data collection point, our hospital has adopted bar-coded medication administration. This system requires the nurse to scan the bar code on the medication as well as the patient’s bracelet. The two scans ensure that the nurse is administering the correct medication to the correct patient at the correct time via the correct route. The system will alert the nurse if an incorrect medication is scanned. As of 2011, bar coding was used in about half of American hospitals, with notable results. One hospital using bar-coded medication administration reported a 22% reduction in dose-omission errors and the prevention of an estimated 1,300 medication errors in a span of eight months. And in a study of more than 17,000 attempted medication administrations in 25 adult inpatient units across six community hospitals on four randomly selected days, a bar-coded medication administration system prevented 187 errors, a figure that represents 1.1% of all medication administrations. As this technology was developed specifically for the health care field, it may have more success at preventing errors than an approach such as the sterile cockpit, which was borrowed from the airline industry.

Efforts to reduce interruptions during medication administration should be integrated with other measures to ensure that a culture of safety prevails on nursing units. For example, we also created a standardized operating procedure for medication administration that specifies that nurses must double-check medications both outside and inside patient rooms. Other factors that promote a culture of safety should also be considered, such as providing adequate nursing staff and taking actions to prevent fatigue.

And while it’s beyond the scope of this article to discuss these topics fully, we support the idea that nurses must feel comfortable reporting medication errors and that educational opportunities should be provided to improve medication error prevention.

In order to influence health care providers, particularly nurses and physicians, it is imperative to use evidence-based safety measures. Nurses can present information on the complexities of medication administration during a facility’s general orientation in an effort to capture multiple disciplines in one setting. Nursing education departments can develop competency assessments to be completed annually.

Nurses and other hospital staff need to appreciate the complexity of medication administration and the cognitive demands it makes on nurses. Interruptions during this critical task should no longer be tolerated.
by all employees, thus emphasizing that the entire health care team is responsible for minimizing interruptions during medication administration.

Our research suggests that entirely eliminating interruptions during medication administration is not feasible because of the nature of the nursing environment. Nurses must respond to patient emergencies and other situations quickly, regardless of whether they are administering medications at the time. However, research also suggests that a return to the old model of having dedicated medication nurses perform most or all medication administration is not a feasible solution either. In a randomized controlled trial, Greengold and colleagues assigned nurses at two hospitals to one of two groups: medication nurses or patient care nurses.22 Medication nurses administered all scheduled medications and patient care nurses administered only stat medications and time-sensitive medications and tended to all other patient care needs. The researchers found no statistically significant difference in error frequency between the two groups.

We believe a solution to decreasing interruptions during medication administration needs to come from a new nursing-centered paradigm. The sterile cockpit approach is a low-cost, high-yield intervention that made a dramatic impact on airline safety and has had some success in certain clinical settings. Because of this success, it’s tempting to apply the technique to other high-risk environments, such as the nursing unit. However, questions remain about the feasibility of this technique and its implementation on acute care nursing units, and further research on adapting this approach is needed. Interruptions will continue as long as nurses are expected to always be available to everyone on the unit, even when they are immersed in tasks that warrant their undivided attention, such as medication administration.

**Keywords:** medication administration, medication errors, quality improvement, sterile cockpit

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