Methodologies for Sustaining Barcode Medication Administration Compliance

A Multi-Disciplinary Approach

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**KEYWORDS**
Barcode medication administration, BCMA, BPOC, workarounds, patient safety, process redesign.

**ABSTRACT**
Numerous recent studies have looked at how nursing workarounds and technology failures can undermine the patient safety benefits of barcode medication administration (BCMA) systems. This article will discuss how Solaris Health System in Edison, NJ, methodically addressed these challenges to achieve and sustain 95 percent compliance with BCMA, one of two major initiatives of the non-profit Solaris Patient Safety Institute, which was established to research best practices that could be shared with other organizations. Through meetings and interviews with frontline nurses and their managers, a multidisciplinary team (pharmacy, IT, nursing) identified 12 educational, technological and process-oriented issues, then developed concrete action plans to address each one (e.g., one-on-one software and device training, additional wireless access points, a “hard stop” to require scanning the patient’s wristband). Key success factors included demonstrating executive dedication, creating a culture of ownership by engaging frontline nurses in solution design and providing a strong support system.

**Methodology**
Beginning in 2002, Solaris set out to improve medication delivery and administration. Phase one was dedicated to process improvement. Headed by the vice president of patient safety, a multidisciplinary team was convened to map out the current and future desired states of key processes: medication cart delivery, patient identification, medication schedules and medication administration. The team included several pharmacists, two nursing informatics coordinators, the director of application integration and...
IT educators solely dedicated to rolling out new technology. The design sessions were facilitated by internal process engineers and our IT vendor, McKesson. Everyone involved attended all current and future state design sessions in order to understand each other’s workflow and the process changes each department would undergo.

**PROACTIVE DESIGN**

It was critical to address the process shortcomings before implementing technology, because technology cannot fix a bad process. It was also critical to proactively circumvent shortcomings that the new technology might introduce. For example, barcode scanning is designed to ensure that clinicians follow the “five rights” of medication administration, not to enable them to simply rely on the technology. According to best practice, any time the clinician scans a medication, he or she must also visually check the patient’s medication list, the medication name and the dose. If an alert identifies a potential error and a mental check doesn’t identify a valid override reason (e.g., stat order) for administering the drug, the system has almost certainly averted an error. It’s a subtle but important distinction in both system design and training.

We also were careful to avoid screen design and navigation, or “real estate” issues, identified in the literature that may contribute to errors. In addition to the mental five-rights check, clinicians are required to review all administration parameters before giving the medication. To facilitate this, pharmacists use the comment section of their order entry system to indicate parameters, which are visible in the BCMA system directly below the medication order upon administration or review.

Another upfront consideration was how to make it easy for physicians to verify current medications by reviewing the electronic medication administration record (eMAR). Our physicians have access to the medication list and real-time administration data via a physician portal that they can log into at the hospital or remotely, any time of day. Since the paper MAR would no longer be available, we built visual alerts that they receive 48 hours and 24 hours before an order expires, and paper notifications are placed on the front of patient charts. Graphs are built to map out laboratory work in relation to medication administration. Physicians also have a dedicated support resource who helps them initially customize their medication views in the portal.

**IMPLEMENTATION**

Phase two involved automating the pharmacy with a robotics dispensing system, pharmacy order entry system and unit-dose barcode packaging solution. Because pharmacy operations are relatively self contained, the implementation was fairly straightforward. In contrast and because of the many known challenges, BCMA implementation would require a multidisciplinary approach.

When it came time to implement BCMA, IT educators with nursing backgrounds were readily available to address any challenges nurses encountered using the new technology. During a daily conference call, team members quickly reviewed all issues identified that day and developed action plans to resolve them. This methodology was successfully repeated across all nursing units.

Despite the careful planning, within three months it became clear that the goal of 95 percent compliance with BCMA procedures was not within reach. We were stalled at around 85 percent. To achieve and sustain the higher goal, a smaller team from nursing, pharmacy and IT was formed. Together, the team engaged a pilot unit and interviewed frontline nurses and their managers to ascertain the root causes—often workarounds—of non-compliance.

The proliferation of workarounds to BCMA protocols isn’t surprising. BCMA is a revolutionary—or discontinuous—technology, in that it enables users to solve a problem, or in this case deliver care, in a radically new way. But if anything, real or perceived, gets in the way of them and their patients, nurses are notorious for finding workarounds. Surprisingly, nurses readily shared the many ways they had devised to avoid using the system as intended.

In addition to interviews, monthly support desk logs were essential to helping us review what software and device issues clinicians were encountering that contributed to the workarounds. A separate monthly report identifying barcode scanning compliance by unit by clinician also was created, along with a staff accountability guide for nurse managers to ensure that a consistent message was conveyed on each unit when addressing repetitive non-compliance. The monthly report is circulated to all levels of the organization, including the board of directors.

**WRESTLING WORKAROUNDS TO THE GROUND**

Using a multidisciplinary approach, we were able to rapidly understand the perceived hurdles and surmount them. These issues were categorized as education-, technology- or process-related, and subcategorized by department such as nursing, pharmacy, physician and IT. Not surprisingly, many issues spanned several categories and departments. Once the data was analyzed, concrete action plans were developed, implemented, reviewed, monitored and re-assessed.

Following are the top issues that were identified, along with resolutions. Many of these echo barriers to BCMA compliance that have been identified in the literature. By working with clinicians within our own organization to understand the root cause of each barrier, we were able to overcome them and reach out original compliance goal of 95 percent.

**Issue/Resolution 1:** Clinicians do not know how to retrieve information (allergies, administration parameters, etc.) or are unaware that it is there, so a combination of screen redesign and additional training was required. Working with our vendor, we customized the screens so that all information is easy to find and view. Screen navigation was incorporated in system education, and competencies were developed and recorded for each individual nursing education session. The least-compliant nurses were given one-on-one sessions to review barcode scanning processes and procedures.

**Issue/Resolution 2:** The clinician administers the medication without scanning the medication barcode first. Many reasons were discovered for not scanning medications before each administration, most related to the labeling technology and processes for overcoming glitches.  

- **Pharmacy is unaware that the medication barcode label cannot be scanned.** A process for returning non-scannable
medication packages was developed. Nursing was instructed to save the non-scannable packages and place them in a specified area for daily pickup by a pharmacy technician. Pharmacy then tested each returned package and corrected the issue. A pharmacy spreadsheet was created where medications returned from nursing units were to be logged and monitored for trends. These results are reviewed monthly by the multidisciplinary team and shared with patient care units in staff meetings.

- The labels for vials and tubes became difficult to scan after one application, because of both shape and size of the packaging. IT installed a tadpole printer to address the smaller size of these medications.

- Some medications delivered off shift and on weekends to the pharmacy were bypassing the barcode linking process, which assigns a unique barcode to each item, and therefore could not be scanned at the bedside. Key pharmacy staff on all shifts were educated to understand and perform the barcode linking process.

- Stat orders do not have a corresponding order in the patient’s profile. Resolution: Some of the newer nurses thought they couldn’t administer any medications without pharmacy first profiling the order, which typically isn’t possible with stat orders. They would wait for a confirmation, which delayed needed therapy. Meanwhile, some experienced nurses decided to give the medication and document it on paper, creating another potential error if the pharmacy later profiled the electronic order, not knowing it had already been given. Both groups required additional training on “zero orders,” which enable clinicians to give medications in a timely fashion while also capturing charges and maintaining an accurate eMAR.

- The clinician administers the medication without scanning the patient’s ID to confirm it is the correct patient. A hard stop was put in place to require scanning the patient ID before administering the medication. An audit trail can be checked if someone is suspected of bypassing the requirement by entering medication administrations via the documentation module.

- Issue/Resolution 6: The clinician bypasses the policy requiring a second signature before administering a high alert/high risk medication. A daily report is generated for the unit manager to review. It displays the total number of high-risk medications administered and provides details about any medication given without the required second signature, including who administered it. This information is included on the monthly compliance report circulated to all levels of the organization, including the board of directors. Finally, an observer who is not a member of the unit staff monitors activity and compares electronic results to actual practice.

- Issue/Resolution 7: The clinician bypasses the policy requiring a second signature before administering a high alert/high risk medication. A daily report is generated for the unit manager to review. It displays the total number of high-risk medications administered and provides details about any medication given without the required second signature, including who administered it. This information is included on the monthly compliance report circulated to all levels of the organization, including the board of directors. Finally, an observer who is not a member of the unit staff monitors activity and compares electronic results to actual practice.

- Issue/Resolution 8: The clinician does not confirm the patient’s new medication orders before administering the medications. A daily report is generated for the unit manager to review. It displays the total number of new orders and the percent that were confirmed, with detailed information on orders that were not confirmed. The report enables the multidisciplinary team to investigate why. For example, if the nurse did not confirm a visual alert for a new medication order scheduled 24 hours later, the alert did not carry over. The next day’s nurse would administer the patient’s medications without being prompted to confirm the order first. We reconfigured the alert to remain active until a confirmation was obtained. An audit revealed that the biggest area of non-compliance involved confirming discontinued orders rather than new orders, which poses a similar safety threat. Compliance required re-educating staff. Any time a physician discontinues an order, the nurse must confirm the action so the order appears on the pharmacist’s worklist of orders to be discontinued. The nurse’s action serves as a double check on the pharmacy to assert such orders from remaining active and potentially reaching the patient.

- Issue/Resolution 9: The clinician exceeds the preset medication administration time. BCMA enables the organization to closely monitor actual administration times, which can affect pharmacokinetics and compromise safety. A lingering perception among nurses, perhaps valid before the pharmacy automation, was that turnaround time for new orders was too long. To uncover the real reasons for “wrong time” administration, a hard stop was put in place requiring the clinician to choose a

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The clinician prepares, scans and transports the patient medications for more than one patient at a time. In no time we encountered the following risky behaviors:

- **Issue 10** The clinician takes the scanner into the room without the cart, so alarms on the cart cannot be seen.
- **Issue 11** The clinician prepares, scans and transports the patient medications for more than one patient at a time.
- **Issue 12** The clinician disables the audio alarms on the scanning device.

**Resolution:** The thermal patient armband described above helped to eliminate issue No. 11, and clinicians were denied the rights to disable anything on their devices to eliminate issue No. 12. But most likely, nurses were only performing any of these actions out of desperation. Once again we enlisted internal process engineers, this time to conduct a post-implementation workflow study of the typical nursing shift to map how many extra steps BCMA required. In retrospect, this should have been done almost immediately post-implementation. During the future state design sessions everything appeared to work on paper, but it is nearly impossible to visualize all of the extra steps required to ensure patient safety.

Based on the resulting spaghetti diagram, we decided to invest in personal workstations for each nurse. The investment required buy-in not only from our chief executive officer and chief financial officer but also from the nursing staff. They needed to know that we were listening to them and understood the reasons for the workarounds. Before investing in new workstations we let a pilot group try several models from various vendors. The winner has a self-contained, narrow footprint that accommodates varying room sizes. Each workstation includes a laptop, scanner, locked medication drawers and a medication preparation area.

To justify the additional investment, process engineers conducted yet another workflow analysis comparing the old carts to the new workstations. Based on four nurses administering medications four times a day, the study estimated a savings of 785 feet, or a 55 percent savings in eliminated motion waste. Going forward, in specialized nursing areas such as the ICU and CCU we plan to install mounted medication cabinets, computers and extended scanners in each patient room.

**SUSTAINED COMPLIANCE**

The post-implementation workflow analysis drove home the sole reason that Solaris implemented BCMA: to improve the safety of our patients and staff. BCMA does not save time, but with careful planning, observation and attention to feedback, added steps can be minimized. More importantly, staff can come to understand the reasons for the added steps and take them willingly. The complaints have all but stopped, replaced by confidential admissions such as, “Please don’t use my name, if it was not for the computer system alerting me, I would have given my patient the wrong medication today.”

Achieving and sustaining our original goal of 95 percent compliance did not come easily. Key success factors included demonstrating executive dedication, creating a culture of ownership by engaging frontline nurses in the solution design and providing a strong support system. A monthly multidisciplinary team call continues to this day. The monthly compliance report, by unit by clinician, also continues to be generated and circulated. Solaris has made a huge financial investment in patient safety, and board members want to know how well we’re doing.

**REFERENCES**