

Integration and Automation Transform Medication Administration Safety

Successful eMARs mandate a multifold integration strategy that includes people, process, applications and technology.

By John Smaling and Mary Ann Holt, R.N., M.S.N.

Adoption of enhanced clinical automation is on the rise, with initiatives such as enterprise imaging and provider order entry on the strategic plans of virtually every healthcare organization (HCO) in the country. However, these initiatives quickly expand beyond mere technological considerations. Full benefit realization of improved patient safety, quality of care and automated clinical functions requires a broader range of integration, one that unites people, process, applications and technology.

This is certainly true for HCOs that want to automate the medication administration process. A fully automated medication administration process provides tools and intelligence that assist in ensuring the “five rights” of medication administration (right drug, dose, patient, route and time) during the prescribing, distribution and administration of a medication.

Figure 1 shows the fully automated medication administration loop, although admittedly, this illustration represents an optimized, highly automated process. While full implementation is not required to achieve patient safety benefits, the absence of one or more of these components leaves opportunities for error. The easy answer is to fully automate, but that brings many integration challenges.

“While automation can eliminate errors, it introduces complexity that brings forth its own set of problems, although they are much better problems to have,” says Richard Demers, director of pharmacy services, Hospital of the University of Pennsylvania. Furthering this reality is the fact that only 1 percent of institutions have embarked on a fully automated initiative.

“Automating the medication loop is a relatively new endeavor nationally, so there is far less industry experience to draw from,” says Dennis Dassenko, CIO, University of Wisconsin Hospital and Clinics. Dassenko is right, although an experience base does exist from which

to draw useful information—and some lessons learned from that experience base are presented here.

Bar Coding and RFID

Fully automated medication administration leverages bar coding as a principle technology. Perhaps the most challenging aspect of bar coding is the need for unit-dose, bar-coded medications. These can be purchased direct from the distributor.

Federal regulations, published in the Spring 2004 *Federal Register*, give drug manufacturers two years to apply bar codes to single-dose units of nearly all drugs dispensed in hospitals. Currently, only 35 percent of medications arrive bar coded, and they are not always available in the dosages, quantities or the time frames needed. When these are purchased direct from the distributor, healthcare organizations can expect to pay an additional 6 cents to 11 cents per unit-dose, bar-coded package. As an alternative, drugs can be ordered in bulk, and packaged and labeled by pharmacy services via manual processes or with high-speed packagers and robotics. These generally range from \$500,000 to \$1,000,000 and, contrary to popular belief, require valuable manpower to monitor and operate.

Regardless of the method, many pioneering hospitals are making the transition to bar-coded packaging to successfully implement bedside administration. At El Camino Hospital, a 95 percent requirement for unit-dose, bar-coded medication was instituted. “Without this high degree of unit-dose, bar-coded medication, there simply is too much variance in the process to institute bedside, automated administration,” says Mark Zielazinski, El Camino’s CIO.

Bar coding of patient wristbands also has challenged organizations, especially in hospitals that treat patients with small wrists such as those in neonatology and pediatric units. The exaggerated curvature of bar codes on small wrists can cause read-errors. To combat this, small flags extended off the wristband to hold the bar code in a

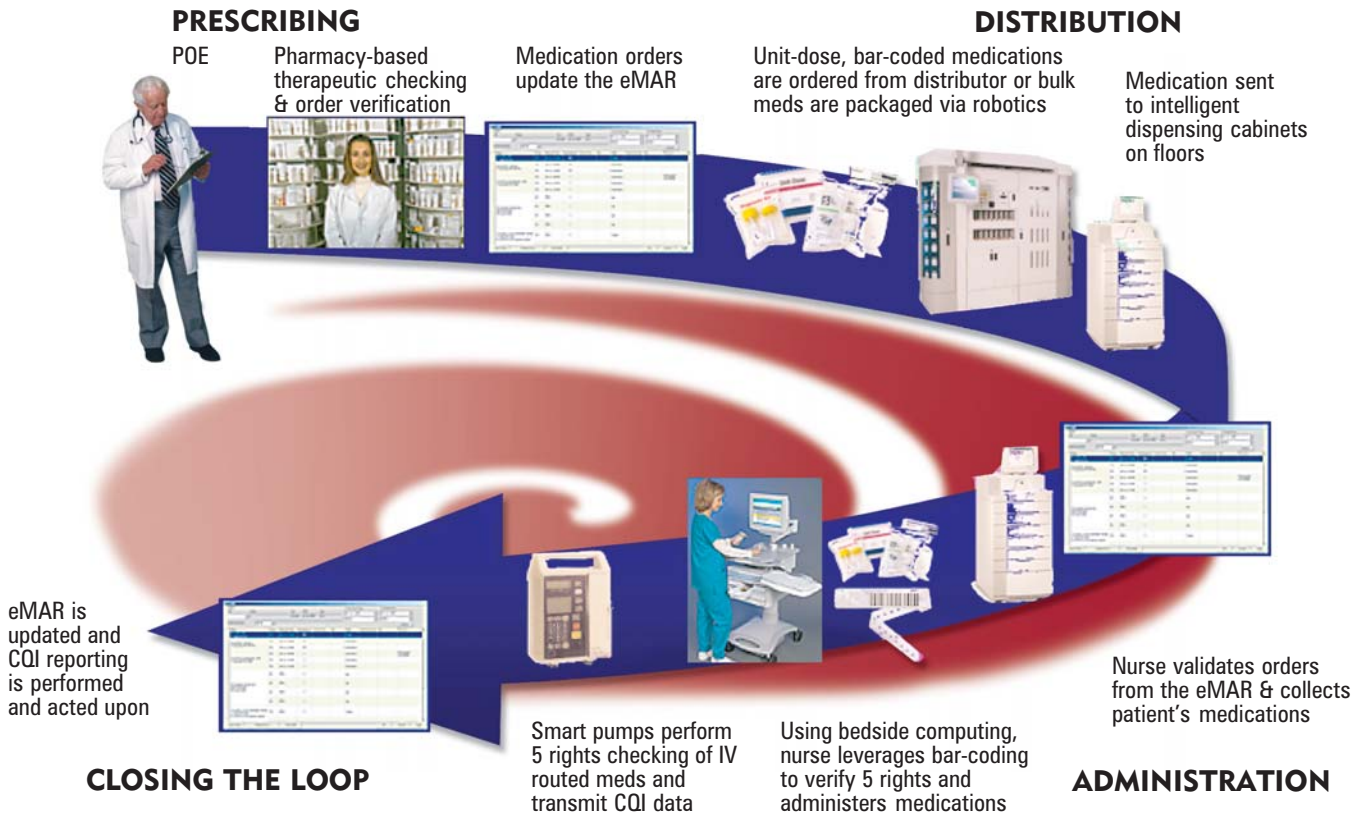


Figure 1: The Fully Automated Medication Administration Loop

readable position have been used. On adult care units, the length of time a patient wears a bar-coded wristband can result in a degradation of the bar code. To manage these issues, procedures should be endorsed to produce and manage new wristbands to replace the old ones.

RFID (radio frequency identification) is an emerging technology that is heralded as the successor to bar coding. Its cost has been reduced to a range where it is being tested in some progressive healthcare organizations. At 20 cents to 30 cents per passive tag, the ability to track “traveling” inventory more effectively can significantly reduce shrinkage and ultimately track both human and material entities within the healthcare organization. Although RFID holds great promise, it’s too early to consider it at the bedside. Active pedigree legislation, like Florida’s Prescription Drug Protection Act, will stimulate use of RFID over the next three years.

Smart Pumps

Seventy percent of medication errors involve injectable medications, and 61 percent of the most serious preventable adverse drug events are IV-related. When considering the magnitude of intravenously administered medications, and that a decimal-point error can result in a massive deviation from an intended dosage, these figures are no surprise.

Integrating intelligent IV equipment into an automated medication administration process will augment patient safety initiatives. Smart pump technology is clinically derived, rules-based software that is embedded in IV pumps.

The basic functionality entails storing therapeutic dosage limits within the pump, error-checking against those limits, as well as sending CQI (continuous quality improvement) data to a central station. Next-generation functionality involves integration with clinical systems to receive patient orders and update the electronic medication administration record (eMAR).

Smart pumps are attractive because they can be implemented in as quickly as 90 days. Pricing ranges from \$2 million to \$3.5 million for a 1000 pump automated system. This includes the cost of the smart pumps as well as the software, implementation and training services. Three primary vendors to consider are Alaris Medical Systems, Baxter Health and Hospira.

Mobility

Computing at the bedside is essential for eMAR reference, bar coding and five-rights checking at the point of administration. Many organizations successfully leverage PDAs with built-in bar-code readers. Others find their form factor too small to perform the most basic of functions, and concise displays impede valid decision-making without a high degree of scrolling. Data input limitations may also be a factor.

Many favor rolling carts with either laptop or small footprint PCs with flat screens. Bar-code readers should be included, and cordless scanners are available. The carts can be ordered in a variety of configurations. Users should consider carts with locking drawers, a reasonable workspace,

larger wheels for easier movement and a smooth, washable surface for desanitizing. Of course, space constraints, physical capabilities of users and cost are limiting considerations.

A reliable, high-performance wireless network infrastructure is an imperative. Contrary to first impression, designing and deploying a wireless network that provides the right coverage, appropriate performance and responsible security is complex. It's critical for HCOs to understand their coverage, user density and usage requirements. They should commission a thorough site survey using the same equipment they plan to deploy to leverage a flexible but secure architecture that supports a high degree of roaming, management tools, and a layered standards-based encryption and authentication scheme.

Impacts on Audiences

Nursing impact. Automating medication administration undeniably impacts many departments; nursing is a significant one. Some nurses may resist a change to their practice, citing the complexities of learning new technology, patient acuity and no time for extra steps. It is important to engage strong nurse administrative leadership and endorsement to favorably position the initiative.

Setting proper expectations also is pivotal to success. "Positioning our medication administration project as a way of saving nursing time would have been a fatal mistake," says Jane Davis, director of information systems at Hamot Medical Center. "This was, and continues to be, a patient safety initiative." Substantial workflow adaptation should be anticipated based on a clear comprehension of current workflow. An interdisciplinary approach to retooling processes should ensure appropriate coordination among nursing, pharmacy and other disciplines.

Pharmacy impact. The impact on pharmacy operations also is significant and should not be underestimated, particularly as it relates to bar coding of medications on a unit-dose basis. "Although the impact on nursing has been significant, the impact to the pharmacy has been many-fold," emphasizes El Camino's Zielazinski. "A significant shift has occurred, from a mostly manual dispensing responsibility to a combination of leveraging and managing automation, spending more time on the therapeutic aspects of dispensing medications and on managing drug distributors."

Training and Support

Training and support should consist of defined training plans for pharmacy, nursing, physicians and other supporting services. Plans should account for backfill re-

sources, on-call personnel and coverage for all shifts that must receive equal billing in training and support efforts.

When planning for live support, prepare for a two-week period of continuous presence in the pharmacy and on the patient care units. Conduct training in a simulated environment that includes actual equipment to be deployed. Create and practice scenarios based upon the facilities' needs. Be creative, use actual medication order sets and mimic as many scenarios as possible. Provide job aids in the form of tip sheets, located in key locations for easy access. Be certain that training sessions emphasize the clear purpose behind the effort: patient safety.

At Hamot, a video offered by Bridge Medical is shown at the beginning of each training session. The 10-minute video narrates three actual incidents that occurred as a byproduct of medication errors, committed by talented, hardworking clinicians who had previously thought these types of errors were only made by others. This has been very effective in maintaining

audience focus on the importance of integrating process change and technology to improve the safety of medication administration.

Reporting and Quality Management

How does an HCO know if its automation efforts truly impact patient safety in a positive way? Report on bad scans, errors detected and averted, and system overrides. Where applicable, compare them to pre-automation baselines. Through well-defined and consistently reported metrics, HCOs can promote successful aspects of the process changes and undesirable outcomes can be managed. The manner in which the data is acted upon is critical. Hamot's Davis says, "The data analysis activity is not designed to take prisoners. Its focus is to identify actionable items to improve the process."

Automating the medication administration process, when done correctly, improves patient safety, and this endeavor is far more process-oriented than it is application- or technology-oriented. It is difficult to argue with results, and those at El Camino are impressive. Since their work began in 2002, El Camino's integrated and automated approach to medication administration has netted them a 44 percent decrease in related errors. Don't all patients have a "right" to results like these?

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