

# Strategies for Safer and More Efficient Medication Management

by Robert W. Squire, Jr.

Recent changes in the health care landscape have raised the stakes for hospital administrators, pharmacy directors and caregivers. Higher salaries and shrinking reimbursement levels are straining operating margins—and pressuring caregivers to work more efficiently. The increased volume and complexity of medications are stretching medication management processes beyond their limits. Greater focus on patient safety is leading to new processes—creating in some cases a “culture of blame” that can infect the entire medication delivery system. And increased transparency of quality data—and greater patient and payer scrutiny of these results—leaves hospitals with little margin for error in today’s hyper-competitive environment.

These trends all contribute to one of the most critical challenges facing healthcare today: the startling number of preventable adverse drug events (PADEs) that threaten successful outcomes each day. Research suggests that as many as one in five medication doses in American hospitals may be administered in error.<sup>(1)</sup> According to a 2006 study by Institute of Medicine (IOM)<sup>(2)</sup>, an estimated 1.5 million patients in U.S. hospitals suffer from preventable ADEs that result directly from errors during the medication use process. Beyond the consequences to patients, these errors cost hospitals an estimated \$3.5 billion each year in 2006 dollars. With the cost of treating each ADE estimated at \$3,244 to \$5,857<sup>(3)</sup>, a single error can quickly reverse a successful treatment protocol and turn a profit into a loss.

This stark reality has made medication management a strategic opportunity across the continuum of care. Administrators are challenging department heads to establish safer and more efficient practices. Pharmacy directors seek innovative systems that streamline the medication delivery process—and help forge tighter connections between pharmacists and clinicians. And caregivers cry out for relief from administrative burden—and for more convenient and immediate access to the information they need to deliver medications accurately at the point of care.

Until recently, most hospitals approached this issue on an ad-hoc basis. But in today’s high-stakes environment, few administrators can accept or afford the consequences of unchecked medication administration to their patients, reputations and bottom lines. In response, some innovators are working proactively with industry partners to develop medication management strategies that address multiple links in the chain of care—from procurement and logistics to bedside delivery and safety processes.

## A System-wide Challenge

Medication errors are difficult to trace to any one department. Though recent studies indicate they occur most frequently in the prescribing and administration stages<sup>(4)</sup>, there is fertile ground for errors across the supply chain. Technicians in hospital pharmacies can make manual picking errors or create inaccurate unit-sized doses. Medication orders can get lost between different care settings or internal departments. IV pumps and other decision support systems can be mis-programmed, misread, overridden or ignored. And overextended caregivers may not have the information at hand to educate patients on how to comply with medication regimens.

Medication-Use System Node	percent of Preventable Events	Interception Rate	percent of Preventable Events <u>Not</u> Intercepted
	A	B	$(A*(1-B)) / \sum(A*(1-B))$
Prescribing	39 percent	48 percent	28 percent
Transcribing	12 percent	33 percent	11 percent
Dispensing	11 percent	34 percent	10 percent
Administering	38 percent	2 percent	51 percent
Total	100 percent	---	100 percent

<sup>†</sup>Preventable ADEs and potential ADEs (intercepted and non-intercepted)

With this much potential for error from so many sources, some hospitals have developed active medication supply chain monitoring programs built around verification, clarification and reconciliation. These programs essentially make hospital staffs directly accountable for improving the safety and quality of medication use.

Others have responded even more proactively by investing in a broad range of products and services—everything from CPOE systems, to automated dispensing machines (ADMs), to bar-code reconciliation systems, to smart pumps and decision support systems.

As problems persist, some administrators have implemented more comprehensive supply chain solutions that integrate new technologies with improved processes. These innovative programs focus on creating electronic interfaces that close critical gaps in the supply chain, on automating processes to reduce human errors and on collecting information at the point of care that can lead to new procedures and protocols.

### **A Supply Chain Pioneer**

Daughters of Charity Health System (DCHS), a California-based integrated delivery network sponsored by the Daughters of Charity of St. Vincent de Paul, has a 150-year tradition of providing care to California's sick and underprivileged—and a clear mission to deliver quality, compassionate, holistic care. In the early 1990s, it began a supply chain initiative that would fundamentally change the way medications were ordered, delivered to patient care units and administered to patients.

The strategy began with input from the hospital's Nurse Pharmacy Liaison Committee, which included all the stakeholders who contribute to the medication management process. Each month, nurse representatives of every care unit—from surgery and ER nurses to diabetic resource and infection control nurses—meet with pharmacy professionals to discuss a variety of patient care and staffing issues. When discussions turned to medication management, the committee identified a number of pain points that the new solution should address. These included protecting the “five rights,” reducing “missing medications”, speeding up the drug administration cycle, and helping pharmacy technicians and nurses work more productively so they could spend more time on patient care.

After considering such alternatives as a centralized unit-dose drug distribution model, Seton Medical Center and other DCHS facilities selected the automated, decentralized medication management system developed by Cardinal Health. It was among the first networks to pioneer Pyxis MedStation® automated dispensing machines (ADMs) that reside on the patient care units. These secure stations immediately began to streamline the medication management process by reducing paperwork, eliminating repetitive time-consuming tasks, and allowing medications to be available and administered in a more timely manner. As nurses remove drugs from the stations, a computer automatically tracks these medications and generates a replenishment order that is filled the next morning. Each day, pharmacy technicians would manually “pick” up to 3,000 doses per day, load them onto carts and refill the ADMs in lieu of filling a patient-specific supply of medications every 24 hours.

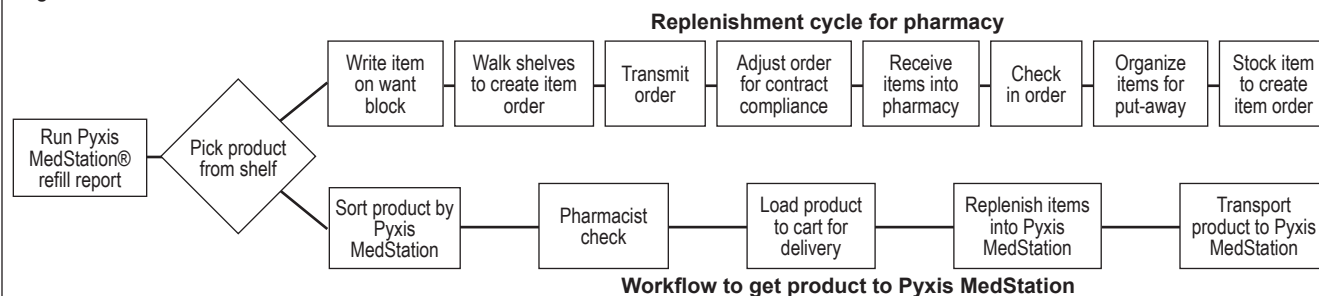
DCHS then worked with Cardinal Health to pioneer CardinalASSIST®, an automated logistical process to replenish bar-coded over-wrapped drugs in efficient units of measure for Pyxis MedStation systems. Implementation of CardinalASSIST streamlined a 14-step manual process to just four steps. In the process, it eliminated all but 12 percent to 15 percent of the manual picking, checking and filling of orders. The process also helped reduced stock-outs by 81 percent and significantly reduced overall pharmacy inventory. Medications now arrive at the pharmacy prepicked per Pyxis MedStation, bar-coded and ready to be loaded into ADMs throughout the facility.

### **A Clear Mandate**

Automated medication management had an immediate and measurable impact on the network's bottom line. At the same time, the system provided continued opportunity for improvement into the overall quality of the medication management process. Specifically, administrators were strongly committed to ensuring that the system was doing everything it could to optimize patient safety. According to Dick Hutsell, Health System CIO, “Our system was giving our pharma team much better control of medications at the nursing units and provided nurses with an additional check and balance. We wanted to augment this model by creating greater integration with clinical records and other data.”

## Logistics: Fewer Steps Leading to Fewer Errors

Logistics without CardinalASSIST®



Logistics with CardinalASSIST



Anne Goldfisher, COO at Seton Medical Center, a member hospital of DCHS, identified another important opportunity: “To provide better information management among caregivers to improve our internal processes and better manage our patient safety risks. We need a way to help caregivers avoid missed medications and delays, and to collect information that helps us understand our processes and improves our performance.” In 2002 the Board convened a planning committee to create a comprehensive technology strategy to support clinical care. “Patient safety came to the surface early in our discussions,” recalls CIO and committee member Dick Hutsell. “We studied early adopters of such technologies as medication bar-code verification and electronic physician order entry and were impressed by the results. We recommended a \$7 million to \$10 million investment to build the robust technology infrastructure necessary to support a new medication management system.” DCHS directors selected Seton Medical Center, a 357-bed acute care facility in Daly City, California, to develop and pilot the new program.

### A Strategic Solution

Rich Mendribil, Seton’s Director of Pharmacy and chairman of the DCHS Pharmacy Directors Council, was charged with executing the medication bar-code bedside verification pilot program. According to Mendribil, “Our preliminary analysis revealed that for 100 percent bar-coded medication verification to work, we would need to repackage and bar-code up to 4 million doses system-wide each year. The pharmacy directors immediately realized that packaging that type of volume was not their core competency, would be labor intensive and would introduce yet another source of error into our medication management system.”

Seton Medical Center and DCHS approached Cardinal Health and challenged its Medication Solutions team to work as a strategic partner to develop and implement a comprehensive medication management solution. This would mean understanding the concerns of all stakeholders, closing the existing gaps in the supply chain and introducing new technologies and processes to improve supply chain performance, and as a result, help to improving patient safety.

This process yielded the bar-coded repackaging solution ReadyScan™, a special portfolio of bar-coded unit of use medications that bridge a gap between what the pharmaceutical industry already provides packaged and bar-coded and what DCHS would always need to repackage and bar-code. As Mendribil explained, “We wanted to receive the prepackaged product the same or next day, order our usual quantity, and integrate the solution with CardinalASSIST®.” Working together, the partners implemented the ReadyScan service to outsource unit dosage and bar-coding.

In the new process, all oral-solid prescriptions that require repackaging and bar-coding are now handled offsite at a dedicated Cardinal Health packaging center. With ReadyScan, specially trained personnel follow the same Current Good Manufacturing Practices (cGMP) used by drug manufacturers to help ensure product quality and safety. Inventory then arrives at the pharmacy in Pyxis MedStation®-specific batches for manual ADM replenishment. According to Mendribil, “The ReadyScan service has reduced our in-house oral-solid repackaging activities by 80 percent while increasing to more than

90 percent our inventory of bar-coded unit of use medications available to nursing.” Seton Medical Center now prepares less than 10 percent of its unit-dose bar-coded medications onsite—and uses new equipment to make these remaining medications easier to package and bar-code.

In recent years, Cardinal Health had expanded its footprint within hospitals to offer complete medication solutions that make health care safer and more productive. Its integrated team next sat down with Seton Medical Center and analyzed the entire medication supply chain. Together, they defined a list of recommended actions that have made the entire supply chain faster, safer and more efficient.

First, Seton Medical Center and Cardinal Health examined the medication reordering process—a supply chain function that affects both inventory volume and product availability. They discovered that although the Pyxis® systems generated ample data on medication use, there needed to be a more rigorous science behind refilling the ADMs. To bring more discipline to the process, they developed accurate min/max inventory parameters for high-volume medications, and then established similar guidelines for more specialized inventory items. When inventory in an ADM falls below par levels, the pharmacy receives alerts tied to specific medications in these cabinets. With appropriate inventory levels now established and constantly adjusted to reflect factors such as time of day, day of week and seasonal demand, in addition to unit doses already prepared and labeled, the pharmacy can virtually eliminate stock-outs and respond faster to initial drug orders and change orders. They also implemented a new contract compliance feature that optimizes orders based on existing contracts. This new system helps ensure appropriate inventory turns in ADMs while maximizing contract pricing.

Next, the two partners studied the process of moving drug inventory from the loading dock to ADMs. They saw an opportunity to accelerate the process of replenishing unit-dose medications stocked in ADM cabinets while also making this process more secure. They pioneered Pyxis PAR<sub>x</sub>® and integrated it with CardinalASSIST® to further automate the pick-check-delivery process. When ADM inventories fall below pre-calculated par levels, the Pyxis MedStation® system generates automated replenishment orders and transmits them to the pharmacy. Pyxis PAR<sub>x</sub> then creates a real-time pick list that helps eliminate picking errors. Technicians simply pick the ADM medication using real-time information and bar-code technology. Merging these picked items with CardinalASSIST and ReadyScan™

helps assure that the product loaded into an ADM is bar-coded for a specific location and bar-coded to the unit of use. This system helps to ensure that the right product goes into the correct pocket. It also enhances security by providing complete chain-of-custody data on all medications during distribution.

*New Medication Management Procedures.* With medication now delivered to patient care units with greater speed and accuracy, Seton Medical Center could introduce new technologies and processes that give nurses more capability at the point of care—the critical last line of defense against medication errors. Seton Medical Center built its improved logistics and new processes around protecting the “five rights” of patients.

DCHS introduced a bar-code wristband system that enables nurses to identify patients, link them to their records and verify that the right medication is delivered to the right patient. According to Michael Day, System Director of Information Technology at DCHS, “The tamperproof, nontransferable identification bands minimize the possibility that identifying data can be lost or transferred from one patient to another.”

Medication errors can also occur as patients move from home, to critical care, to medical/surgical care. Seton Medical Center implemented a new medication reconciliation process that gives nurses and physicians easy access to historical data on each patient’s medication use. Using data collected across different technologies, the pharmacy can now generate custom reports that list all medications patients are using, along with changes to these regimens before and during the hospital stay. This information helps caregivers better understand each patient’s history and reconcile medication changes along the patient line of care.

Studies also show that educating patients about their medications can significantly improve both safety and outcomes.<sup>(5)</sup> With the Pyxis system, nurses simply print drug reference information and review it with patients and family members. Alternatively, they can print out instructions and safety indications from the network’s MedTeach System. This education process is fulfilling for nurses—and is an important driver of patient safety and satisfaction.

*Improved workflow.* Recent studies by the Murphy Leadership Institute reveal that every 1 percent of wasteful work hospitals eliminate improves their operating margins by 0.25 percent.<sup>(6)</sup> For Seton Medical Center, adopting a decentralized model made a number of workflow processes much more efficient.

In the hospital's pharmacy, outsourcing unit-dose packaging and bar-coding through ReadyScan™ eliminated much of the time technicians spent repackaging medications into unit doses and bar-coding them for nurse administration. Mendribil explained, "We have redeployed our pharmacy technicians to other bar-coded, unit of use packaging needs, such as liquids and bar-code database management, along with other safety-related processes."

In Seton Medical Center's patient care units, new technologies and processes have saved nurses countless steps, relieved stress and freed up more time to spend at the patient's bedside. Nurses waste almost no time responding to stock-outs, because CardinalASSIST® and ReadyScan make a high percentage of unit-dose medications available in ADM cabinets. The automated system for managing controlled medications virtually eliminates time-consuming paperwork. And when physicians issue STAT orders, nurses simply check the STAT box and scan the order to pharmacy using Pyxis® Connect. The order goes immediately to the top of the pharmacy's queue for high-priority fulfillment.

### **A Platform for System-wide Success**

Before the current initiative began, DCHS had only limited visibility into the performance of its medication management system. Today, new technologies and processes are helping it establish both a performance benchmark for medication management, and specific quality measurements that range from inventory carrying costs to STAT response times. At Seton Medical Center, the initial and ongoing results have been positive. The hospital has:

- Reduced pharmacy inventory by 37 percent;
- Reduced repackaging in the pharmacy by 80 percent in the first 14 months;
- Increased time pharmacists and nurses spend on clinical activities;
- Increased the percentage of bar-coded unit of use medications stocked in ADMs from 32 percent to 92 percent;
- Reduced stock-outs by 81 percent;
- Reduced response times to STAT orders by more than 50 percent.

### **The Next Frontier**

Seton Medical Center's pilot program demonstrated the benefits of introducing new medication management technologies and processes across the entire DCHS system. It also validated the benefits of working with a long-term strategic partner whose deep understanding of strategic objectives and hospital operations allows fast, efficient implementation. The IDN has established Pyxis MedStations® in all six facilities, and five facilities now stock more than 90 percent of their medications in unit-based ADMs. DCHS has also implemented ReadyScan in all six facilities and CardinalASSIST automated replenishment in two hospitals with another two scheduled in 2008. Pyxis PAR<sub>x</sub>® is installed in three of the six sites with the fourth site already scheduled.

As a medication management pioneer, DCHS built its current system over more than a decade, incorporating new technologies as they became available. Today, thanks to the path established by early adopters, hospitals can move from 24-hour cart exchange to 90 percent bar-coded unit of use medications at the point of care in 18 to 24 months, provided they have the full support of nursing and hospital administration.

In today's environment, hospital administrators can no longer afford to expose their patients, balance sheets and reputations to costly medication errors. Each year, new medications and a growing elderly population continue to drive up medication volumes. At DCHS and other proactive and innovative hospital systems across the country, an unwavering commitment to protect patient safety, maintain open communication between stakeholders and implement disciplined medication management strategies is yielding powerful results that can be charted from the patient's bedside to the hospital's bottom line.

## Footnotes

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### About Daughters of Charity Health System

The Daughters of Charity Health System (DCHS) is a regional healthcare system of six hospitals and medical centers spanning the California coast from the Bay Area to Los Angeles. Established in 2002, the health system is sponsored by the Daughters of Charity of St. Vincent de Paul who, for more than 370 years, has been serving the sick and the poor through healing ministries around the world. For more information, visit [www.dochs.org](http://www.dochs.org).

### About Cardinal Health

Headquartered in Dublin, Ohio, Cardinal Health, Inc. (NYSE: CAH) is an \$87 billion, global company serving the healthcare industry with products and services that help hospitals, physician offices and pharmacies reduce costs, improve safety, productivity and profitability, and deliver better care to patients. With a focus on making supply chains more efficient, reducing hospital-acquired infections and breaking the cycle of harmful medication errors, Cardinal Health develops market-leading technologies, including Alaris® IV pumps, Pyxis® automated dispensing systems, MedMined® data mining services and the CareFusion™ patient identification system. The company also manufactures medical and surgical products and is one of the largest distributors of pharmaceuticals and medical supplies worldwide. Ranked No. 19 on the Fortune 500 and No. 1 in its sector on Fortune's ranking of Most Admired firms, Cardinal Health employs more than 40,000 people on five continents. More information about the company may be found at [cardinalhealth.com](http://cardinalhealth.com).