Bar-Code Scanning
At Four Health Care Facilities in the U.S.
Cindy H. Dubin

INTRODUCTION
Between 2005 and 2007, medical errors cost Medicare more than $6.9 billion and were responsible for more than 92,000 potentially preventable in-hospital deaths among the plan’s beneficiaries. Of all medical errors, medication administration mistakes have ranked among the most common, harming at least 1.5 million people every year, according to a 2006 report from the Institute of Medicine of the National Academies (IMNA).2

On average, at least one medication error per hospital patient occurs each day, which equals 400,000 errors each year, according to IMNA. The extra medical cost of treating drug-related injuries occurring in hospitals alone conservatively amounts to $3.5 billion annually.3

Because of these alarming rates, many hospitals in the U.S. have instituted rigorous patient safety programs. At the heart of these programs lies health information technology (HIT). One important component, computerized prescriber order entry (CPOE) systems for ordering medications, shows promise for reducing drug-related mistakes. These systems can also automatically alert prescribers to possible drug interactions and potential allergies to medications. As of 2010, all hospital pharmacies are expected to be able to receive prescriptions electronically, according to the IMNA report.

Hospital administrators are also starting to focus on another electronic capability, bar-code scanning. According to Stuart Levine, PharmD, an informatics specialist at the Institute for Safe Medication Practices (ISMP), bar coding can be used throughout a patient’s hospital stay, from pharmacy to point of care, to reduce the risk of medication errors.

“Fifty-one percent of the harm that occurs in the hospital occurs at the point of care,” Dr. Levine said. “And from a hospital pharmacy’s perspective, bar coding can help ensure that the medication that is sent to a patient is correct.”

Bar coding, combined with other techniques, is helping hospitals forge a new drug safety strategy. IMNA Co-chair J. Lyle Bootman, Dean and Professor in the College of Pharmacy at the University of Arizona in Tucson, said in the IMNA report:

Our recommendations boil down to ensuring that health care providers have the tools and data necessary to prescribe, dispense, and administer drugs as safely as possible and to monitor for problems. The ultimate goal is to achieve the best care and outcomes for patients each time they take a medication.

This article focuses on the implementation of bar coding at HCA Virginia Health System, CHRISTUS St. Patrick Hospital, the Veterans Health Administration, and the Henry Ford Health System.

THE 4 R’S OF MEDICATION SAFETY
The goal of hospital administrators is to adhere to the 4 R’s of medication safety: be sure the right dose of the right medication is being given to the right patient at the right time.

For years, industry literature has stated that these objectives are often hindered by incompetencies in hospitals, such as order misinterpretations, incomplete or improper transcriptions, communication breakdowns, drug misidentification, faulty dose checking, drug-stocking problems, and lack of standardization.4

ADOPTION OF BAR-CODE SCANNING IN TWO FACILITIES
HCA Virginia Health System
Noel Hodges, RPh, MBA, Division Director of Pharmacy Services at HCA Virginia, said that the hospital was no different than any other when it came to these common problems. In 2000, HCA senior administrators—clinical services leaders, pharmacists, nurses, and physicians—made a commitment to institute a medical safety strategy using HIT. Now all 159 hospitals in the HCA network use a MediTech information system.

MediTech was chosen because it afforded HCA the chance to achieve a closed-loop medication management strategy. Mr. Hodges said that MediTech supports the full spectrum of medication delivery, including CPOE, automatic drug-dispensing cabinets, bar-coded medication administration, and intravenous (IV) smart pumps. All drug products share a single formulary, a medication administration record (MAR), an allergy record, and a medication history, ensuring that care providers base their decisions on the most up-to-the-minute patient data. Similarly, medications are easily reconciled and converted throughout all health care settings in the hospital with no data re-entry required. Prescriptions are communicated electronically to the inpatient pharmacy.

In 2002, HCA implemented MediTech’s bedside medication verification (BMV), or point-of-care, scanning module. When the pharmacy enters a medication order for a patient, that information is uploaded to the patient’s electronic health record (EHR). The pharmacist ensures that the medication has a bar-code label before it leaves the pharmacy. A nurse dispensing the medication at the point of care scans the label on

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the drug and the bar code on the patient’s identification bracelet to ensure that the right patient is receiving the right dose of the right drug at the right time. If there is any deviation, such as if a medication is dispensed before the proper time, the system flags the nurse.

Mr. Hodges explains:

When a nurse scans the medication and the bar-code software realizes that the wrong patient is about to be given that medication, the medication cannot be dispensed. Before, odds were [that] the patient would have received the medication.

CHRISTUS St. Patrick Hospital

Until recently, the potential for serious outcomes was a definite possibility at CHRISTUS St. Patrick Hospital in Lake Charles, Louisiana, because medication errors were occurring at patients’ bedside, explained Tamica Francois, LPN, BMV core team leader. The hospital staff, including nursing, pharmacy, and information management—chose to implement BMV.

Like HCA, CHRISTUS chose MediTech. When nurses at CHRISTUS use the bar-code scanner, they scan the patient’s bar-coded arm band (Figures 1 and 2), which displays all of the drugs that are attached to the patient’s profile. Each drug’s bar code is then scanned. If the medication is not on the patient’s profile, the nurse receives a system warning.

Ms. Francois noted that the hospital pharmacy lets the system know when a medication is to be given and provides the correct dosage. If the system identifies a discrepancy, the nurse is alerted.

“This is a completely pharmacy-driven process,” she said. “The [pharmacists] input the time, dose, and patient, and there is no chance of deviating from the administration schedule.”

To date, three CHRISTUS hospitals are using BMV. Because all previous medication administration procedures were manual, CHRISTUS had no way of tracking its errors to compare against the BMV. However, Ms. Francois said she expects the automated system to result in a decrease in variances of 85% or more.

A DO-IT-YOURSELF BAR-CODE SYSTEM AT TWO FACILITIES

In an effort to reduce variations in patient profiles, purchasing a bar-code system is the solution for many hospitals. For other facilities, a self-developed system is more beneficial because it can be customized to the hospital’s needs and can be more easily integrated with existing software in other departments.

Veterans Health Administration

The Veterans Health Administration (VHA) was inspired to develop its own bar-coding system when a nurse was returning a rental car. Seeing the rental car company employee use a hand-held device to scan a bar code located in the trunk of the returned car led the nurse to consider a similar application for identifying patients and medications, explained Chris Tucker, RPh, VHA Director. The Department of Veterans Affairs (VA) provided $50,000 in startup fees to develop a bar-code system that would aid in administering medications and improving patient safety. The resulting prototype was a real-time, wireless, point-of-care technology with an integrated bar-code scanner to be used at 22 nursing units in the VA’s Eastern Kansas Health Care System (Figure 3).

The prototype acted as a catalyst for the VHA to create a system that could be used at all of its medical centers nationwide. The resulting Bar Code Medication Administration (BCMA) was to validate medications and document medication administration electronically. BCMA was designed so that each time a nurse scanned the bar code on an ordered medication, the system would validate whether the patient received the correct medication, whether the dose was correct, when administration was scheduled, and when the medication was given.

BCMA was integrated with existing VA pharmacy and nursing software programs. Historically, the two departments had not worked cohesively to address drug delivery and administration problems. Standardizing order guidelines facilitated a coordinated medication-order and drug-delivery process.

Ron Schneider, a pharmacist consultant at VHA, said that a multidisciplinary team, consisting of information management,
nursing, and pharmacy specialists, was critical to installing BCMA. He commented:

“Understanding one another’s working conditions and collaborating our efforts improved the implementation process.”

Today, all VA medical centers are benefiting from BCMA. Between 1993 and 2001, reductions in medication, dosing, timing, and patient errors have been considerable (Table 1). In 2002, the group released BCMA Version 2.0, which featured a series of checks and balances for IV therapy. Future goals of the BCMA project are to interact with other clinical software packages containing information on vital signs, nutrition, and laboratory results.

**Henry Ford Health System**

It was the surgical pathology laboratory at the Henry Ford Health System in Detroit that was the driving force behind developing and implementing bar coding. Dr. Richard J. Zarbo, Senior Vice President for Pathology and Laboratory Medicine, said that the manual processes in the lab had been unchanged for years and there was an opportunity to improve them.

“Everything we did was pencil- and paper-based, which opened the door for misidentifying lab specimens,” he said.

Five years ago, Dr. Zarbo and his team set out to design a bar-code system that would facilitate the lean processing that inventor Henry Ford was famous for in his automobile-manufacturing plants. Dr. Zarbo explained that the goal was to standardize the work flow from the time a specimen is received in the laboratory to the time the information is input into a patient’s EHR and all the steps in between.

Every specimen entering the lab receives a bar code, and the information on that label is entered into the laboratory information system (LIS). The LIS identifies and verifies the patient and the accompanying specimen. As the specimen is passed to each work cell in the laboratory for various phases of analysis, technicians scan the bar code. This opens the LIS case file and downloads information required to perform the work. All work performed on the specimen is entered into the patient’s EHR.

Dr. Zarbo said: “Our workstations now perform their work faster, the technicians are happier, and we can handle more content. Our former manual process was a non-value added one, and I didn’t realize that until it went away.”

Since bar coding was implemented, the Henry Ford pathology laboratory has seen a 95% reduction in errors. However, Dr. Zarbo quickly put that percentage into perspective:

Surprisingly, with our manual system, our error rates were not that high, so we are not talking about reducing high error rates with bar coding. It’s not bar coding that is the solution; it’s the standardized work flow. However, I do admit that having 95% fewer mistakes does help me sleep a lot better.”

**THE OBAMA ADMINISTRATION’S FOCUS ON ELECTRONIC TECHNOLOGY**

Despite the significant potential for reducing medical and medication errors, industry statistics indicate that the adoption of bar coding by hospitals is only at the beginning of a new era. A 2008 survey by the American Society of Health-System Pharmacists (ASHP) showed that only 25% of hospital pharmacies used bar-code reading systems to administer medications.5 Of those same respondents, only 12% used CPOE systems and 83% used automated drug-dispensing cabinets.

Dr. Levine said:

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**Table 1 Reported Error Rate per Total Doses of Medication Dispensed in the Veterans Health Administration**

<table>
<thead>
<tr>
<th>Error Type</th>
<th>1993 (%)</th>
<th>2001 (%)</th>
<th>Improvement (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrong medication</td>
<td>0.00371</td>
<td>0.00091</td>
<td>75.47</td>
</tr>
<tr>
<td>Wrong dose</td>
<td>0.00334</td>
<td>0.00127</td>
<td>61.97</td>
</tr>
<tr>
<td>Wrong patient</td>
<td>0.00138</td>
<td>0.00009</td>
<td>93.48</td>
</tr>
<tr>
<td>Wrong time</td>
<td>0.00143</td>
<td>0.00018</td>
<td>87.41</td>
</tr>
<tr>
<td>Omission</td>
<td>0.00917</td>
<td>0.00272</td>
<td>70.34</td>
</tr>
</tbody>
</table>


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[Figure 3 A nurse scans a patient’s wrist band at a VA hospital. (Courtesy of Veterans Administration Health System.)](#)
Bar-Code Scanning at Four Facilities

I would like to see that bar-code use percentage reach 100%. However, bar coding is only one technological strategy that will solve the medication error rate in this country. There needs to be a safety net formed by using all of the technology available to hospitals today.

To this end, the federal American Recovery and Reinvestment Act provided $19 billion to fund HIT, with an emphasis on the increased use of EHRs. Hospitals, insurance companies, and other medical institutions use EHRs to keep track of patient information. This past February, another $1 billion was earmarked to be invested in HIT.

In a speech at George Mason University, President-elect Obama said:

To improve the quality of our health care while lowering its cost, we will make the immediate investments necessary to ensure that, within five years, all of America’s medical records are computerized. This will cut waste, eliminate red tape, and reduce the need to repeat expensive medical tests. But it won’t save just billions of dollars and thousands of jobs; it will save lives by reducing the deadly but preventable medical errors that pervade our health care system.

REFERENCES


ATTENTION READERS

Have you recently implemented bar-code scanning at your institution? Tell us about your experience. Send an e-mail to: ssherritze@medimedia.com.

Responses may be published in an upcoming issue.