The main mission of any institution-based pharmacy is to get the right medication to the right patient in a safe and timely manner. Today, for many hospitals and health systems this mission includes the incorporation of bar code technology to verify every dose of medication.

Bar code medication administration (BCMA) is the cornerstone of Lahey Clinic Medical Center’s medication safety system. However, bar codes alone do not ensure that the right patient will always get the right medication. The goal of the pharmacy should be ensuring that the nurse has the right medication, in the right pocket of the automated dispensing cabinet, with an operational, readable bar code on it. By instituting several standard procedures during the receiving, dispensing, and administration of medications, we have been able to achieve a scan rate at the bedside of around 99%.

Repackaging Approach
Part of the preparation for BCMA implementation involved determining how to handle our repackaging needs. We decided to purchase as many products as possible from the manufacturers in a unit dose bar code-ready format, which accounts for about 80% of our repackaged medications. For those products not available in unit dose, we determined three options: for high-volume products, Safecor Health in Woburn, Massachusetts, was chosen as a repackager; for lower-volume products, the Talyst repackager, model JV 150, was selected and implemented; for those products deemed inappropriate for this machine—such as penicillin, sulfa, chemotherapy, liquid preparations, and controlled substances—the Medi-Dose MILT with bar code system was chosen. While our repackager contains 150 canisters, we routinely use about ten canisters as well as the tray feature of this device, which enables us to repackage oral solid medications in larger quantities.

Some of the medications that we outsource are high-volume items that can be bought cheaply in bulk, such as calcium chloride, omeprazole, and atorvastatin. We also outsource Cepastat as we do not have the capabilities to repackage this in-house, and we have our vendor put labels on medications that do not already have bar codes, such as various inhalation products.

Our biggest repackaging challenge involves injectable vials that either do not have a bar code or are multiple-dose vials, such as insulin. For these products a “Lahey specific NDC number,” with corresponding bar codes was created. These Lahey specific NDC numbers have been mapped in both our pharmacy information system and our electronic medication administration system. For insulin products we have developed rolls of bar codes specific to each type of insulin provided to the nursing units. This way a bar code can be placed on the syringe in the medication rooms, and then the nurse can bring the syringe with bar code to the patient’s room. Because insulin is considered a “high-risk” medication, the verification of the dose and placement of the correct bar code label requires a witness and must be electronically documented in the system.

Scanning Procedures
Our near perfect scan rate on the nursing units is primarily due to the number of times a medication is scanned prior to leaving the pharmacy. We determined that the pharmacy receiving area was the best place to first perform bar code evaluations for each product, and we assigned a technician specifically for this task. This full-time pharmacy-receiving technician also is responsible for our internal repackaging functions. No medication leaves our receiving area, dubbed “customs,” until it has been scanned using the same scanner that is used on the nursing units. If the medication does not scan properly in the receiving area, the receiving technician informs the pharmacist in charge of the BCMA system. This pharmacist
will check the bar code database to ensure the product is mapped. Every product coming into the pharmacy must be mapped in the database to ensure scanning at the bedside.

Once all medications have been bar coded and scanned in the receiving area, they are brought to the dispensing area for a pharmacist to check, and for a technician to place into the carousel. Again, no items are placed into the carousel unless they are in bar coded unit dose. When placing the inventory into the carousel, all medications are scanned. And when a medication is removed from the carousel for dispensing, it is scanned yet again, to confirm that it will scan on the nursing units. This step is a triple check on our systems, ensuring no missed steps in the receiving process, and no compromise of the bar code while in the carousel, such as a medication being returned to the carousel without the proper bar code. By performing a scan check at the time of dispensing, we are assured that the medication being dispensed can be read by the scanner on the nursing unit.

**Medication Dispensing**

Another important aspect of our medication delivery process is the use of an auto-replenishment system, which along with the carousel, replaced ADC batch refills. Batch refilling was an inefficient process and did not necessarily ensure the right medications were on the nursing units. The batch refill process sometimes refilled medications that were neither in a stock critical-low status or in an ordered status—so there was no reason to refill these medications. With the new process, only needed medications are being refilled or loaded. For stock critical-low medications (those items that reached 50% of their minimum inventory level) an automatic message is sent from the ADC on the nursing unit to the carousel. A label is generated from the carousel; the technician can then process that medication and place it first in the scanning bin, then the checking bin. For medications not stocked in a particular ADC, a bulletin automatically prints out in the pharmacy. This bulletin is processed by a technician, and a message is sent to the carousel that a medication is needed. These medications are then processed as described above. This new approach to refilling has resulted in an overall stock-out rate reduction of 50%—from 0.90% to 0.45%.

We have realized additional benefits from the
auto-replenishment system. For example, we now have an electronic record that documents the pharmacist has checked the medication prior to it leaving the pharmacy. While a pharmacist check has always been performed, previously we did not know which pharmacist had checked a given medication. In addition, when the technician scans the medication at the ADC, the correct pocket automatically opens, thus closing the loop on our medication delivery system.

At this point, we have delivered the right medication to the right pocket in the ADC and we know that each dose of medication has a readable bar code to ensure the safe administration of that medication. (See the Receiving-Delivery Process chart on page 13.)

**From the Pyxis Machine to the Patient**

Once the right bar coded medication is in the ADC, ensuring the medication is safely administered to the patient is the next important step. This is where all the pharmacy efforts really pay off. All medications are obtained from the ADC through the profile that has been created by the pharmacy and verified by the nurse using the CareFusion software. Only critical-care medications can be obtained by an override. The current override rate is less than 1%, with 50% of those overrides in the intensive care areas.

The nurse previews the medications due using a “preview meds” list on the handheld device and then selects the medications to be administered via the ADC. Since all medications have a readable bar code on them at this point, the nurse can take the medication to the patient’s room and scan the patient’s wristband to ensure they are getting the medication. After that, the nurse will scan their bar coded identification badge to document each transaction with an electronic signature, and finally they will scan the medication bar code to ensure proper administration. One of the challenges at this step is to make sure that the bar code is being scanned at the bedside prior to administration of the medication and to recognize that the process should be stopped if the bar code cannot be read at that point. In addition, the correct formatting of the order requiring the nurse to scan each medication is imperative to assure the correct warnings are triggered when the scanned dose does not match the order. Nursing and pharmacy must work together to make this happen.

**Conclusion**

By implementing new technology and standard procedures during the receiving, dispensing, and administration of medications, we have been able to provide a safer medication system for Lahey patients and their caregivers.

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**Ernest R. Anderson, Jr, RPh, MS**, is director of pharmacy at the Lahey Clinic in Burlington, as well as the Lahey Clinic North in Peabody. He is also associate clinical professor of pharmacy at Northeastern University College of Pharmacy and Allied Health

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Professions, and adjunct associate professor of Pharmacy at Massachusetts College of Pharmacy and Health Sciences, both in Boston. Ernest received his bachelor’s and master’s degrees from Northeastern University College of Pharmacy and Allied Health Professions in 1976 and 1979, respectively.

Martin J. Goldberg, RPh, MBA, is the manager of inpatient operations at Lahey Clinic in Burlington, Massachusetts. Martin received his BS in pharmacy from the University of Rhode Island in 1980, and his MBA from Widener University in 1985. He has been a practicing pharmacist for 29 years in a variety of settings including retail, home care, and hospital. Since 1995 Martin has been actively involved in pharmacy informatics. In addition to his informatics experience, he has over 12 years of hospital pharmacy management experience.

Margie Sipe, RN, MS, is a nursing performance improvement innovator at Lahey Clinic in Burlington. With a BSN from Lebanon Valley College, and an MS in nursing from Boston College, Margie has extensive experience in nursing education, nursing leadership, and consultation.

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