ASHP Statement on Bar-Code Verification During Inventory, Preparation, and Dispensing of Medications

DEVELOPED THROUGH THE ASHP SECTION OF PHARMACY INFORMATICS AND TECHNOLOGY AND APPROVED BY THE ASHP BOARD OF DIRECTORS ON APRIL 15, 2010, AND BY THE ASHP HOUSE OF DELEGATES ON JUNE 6, 2010

Am J Health-Syst Pharm. 2011; 68:442-5

Position

The American Society of Health-System Pharmacists encourages hospital and health-system pharmacies to incorporate bar-code scanning into inventory management, dose preparation and packaging, and dispensing of medications. The purpose of such scanning is to ensure that drug products distributed, deployed to intermediate storage areas, or used in the preparation of patient doses are the correct products, are in-date, and have not been recalled. Such bar-code scanning should be employed in:

- Stocking of inventory both in the pharmacy and in other locations from which patient medications may be dispensed (e.g., an automated dispensing device),
- Manual packaging of oral solid and liquid medications,
- Compounding, repackaging, and labeling processes (e.g., scanning of source ingredients),
- Retrieving medications from automated dispensing devices, and
- Dispensing from the pharmacy to any location.

Prudent use of bar-coding technology in these processes will enhance patient safety and the quality of care by improving the accuracy of core pharmacy functions, closing potentials gaps in the bar-code-assisted medication administration (BCMA) process, and allowing better allocation of pharmacists' knowledge and skills.

Background

Discussion of the role of technology in improving medication safety almost universally focuses on BCMA or computerized provider order entry (CPOE), despite evidence of medication errors that neither CPOE nor BCMA could prevent.[1,2] A number of activities in the medication-use process create opportunities for error outside of medication ordering and administration systems, such as:

- Receiving of inventory from suppliers and stocking of inventory locations from which patient medications may be dispensed (e.g., stocking unit-

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The bibliographic citation for this document is as follows: American Society of Health-System Pharmacists. ASHP statement on bar-code verification during inventory, preparation, and dispensing of medications. *Am J Health-Syst Pharm.* 2011; 68:442-5.

Index terms: American Society of Health-System Pharmacists; Codes; Drug administration; Errors, medication; Hospitals; Technology

DOI 10.2146/sp100012

based automated dispensing devices with medications that may not be delivered to the bedside in their original packaging).
- Packaging of medications, which has become more prevalent as BCMA systems are more widely adopted by health systems and manufacturers have discontinued unit dose packaging of medications.
- Manual packaging of liquid medications in ready-to-administer form.
- The compounding of medications.
- The dispensing of patient-specific medications (e.g., 24-hour medication carts, nurse servers).

In addition, for BCMA to function, a vast majority of doses must be accurately bar coded, meaning there must be a highly reliable relationship between the information in the bar code and the contents of the dose. Additionally, the bar code must be readable by commercially available scanners. Although doses delivered directly from manufacturer-labeled packages generally meet these conditions, there are numerous drug products that may not:

- Commercial products may lack a readily readable bar code, may have an irregular package shape that confounds the ability of scanning equipment to read the bar code, or may have a bar code in a symbology format that cannot be interpreted by the institution's bar-code scanning software.
- Nurse-prepared medications (e.g., insulin doses, heparin boluses, or syringes pre-drawn in the operating room) may be prepared at a location other than the patient's bedside, with the result that there is no labeling of any kind on the dose when it is administered.
- Compounded medications (e.g., sterile preparations) are often labeled by the pharmacy with a bar code that references a prescription or order number that describes the intended contents of the prescribed dose but provides no assurance that the prescribed contents were actually used in the product's preparation.

Benefits of Bar-Code Verification During Inventory, Preparation, and Dispensing

Initial estimates of the contribution of pharmacy dispensing errors to the overall medication errors were quite low.[3] However, recent reports have suggested that adding bar coding to the pharmacy dispensing process can significantly reduce opportunities for medication errors at the bedside and reduce the occurrence of potential adverse drug reactions.[4-6] Incorporating bar-code scanning in inventory management, dose preparation and packaging, and dispensing can improve patient safety in the following ways:

- Scanning during stocking in the pharmacy or patient-care locations (e.g., loading of an automated dispensing device) can help ensure that the product is placed in the correct location.
- Scanning during the retrieval of medications mitigates the hazards of erroneous medication stocking, which is especially important in the case of automated dispensing devices, where there is a potential risk that caregivers will override controls and remove medications for immediate use.
- Scanning of source ingredients during compounding, repackaging, or labeling processes can ensure that labeled doses contain the appropriate ingredients. Additionally, such scanning creates a reliable link between the information in the final package's bar code, its contents, and the National Drug Code (NDC) of the source container, which may be required to satisfy billing requirements (e.g., those of the Centers for Medicare & Medicaid Services).
- Scanning on dispensing can help prevent look-alike, sound-alike medication substitution errors that are difficult to visually detect, can identify and remove from distribution drug products whose bar codes are missing or unreadable, and prevent the distribution of expired or recalled products or facilitate retrieval in case of a recall.
- Scanning during any of these activities permits accumulation of an audit trail for each transaction in the inventory, preparation, and dispensing process. This information provides indications of the frequency of error encounter and detection, a record of the amount of time needed to perform

ASHP gratefully acknowledges the following organizations and individuals for reviewing drafts of this statement (review does not imply endorsement): American Association of Critical Care Nurses (AACCN); American Nurses Association (ANA); Institute for Safe Medication Practices (ISMP); Rhode Island Society of Health System Pharmacists (RISHP); South Carolina Society of Health-System Pharmacists (SCSHP); Wyoming Society of Health-System Pharmacy (WSHP); Linda Annecchini, M.S.; James L. Besier, Ph.D., FASHP; Carol J. Bickford, Ph.D., RN-BC (ANA); Denny C. Briley, Pharm.D.; Mary E. Burkhardt, M.S., FASHP; Richard Capps, Pharm.D.; William W. Churchill, M.S.; Debra Cowan, Pharm.D.; Michele Danish, Pharm.D, FASHP; Brent I. Fox, Pharm.D., Ph.D.; Karl F. Gumpper, BCNSP, BCPS, FASHP ; Kathleen M. Gura, Pharm.D., BCNSP, FASHP; J. Chad Hardy, Pharm.D., M.S.; Robi Hellman, RN, MSN, CNS (AACCN); Matthew R. Keith, B.S.Pharm., FASHP; Stan Kent, M.S.; Thomas E. Kirschling, Pharm.D., M.S.; Jim Lile, Pharm.D.; Jeff Little, Pharm.D., M.P.H.; Donald Lynx, M.B.A., FASHP; Leslie R. Mackowiak, M.S.; Linda Gore Martin, Pharm.D., M.B.A., BCPS (WSHP); Denise McKenzie, CPhT; Joel Melroy, Pharm.D., M.S., BCPS (SCSHP); Ian Orensky, Pharm.D., M.S.; Stephanie C. Peshek, Pharm.D., M.B.A., FASHP; Tommie Peterson, B.S.Pharm.; James Ponto, M.S., BCNP, FASHP; Brad Rognrud, M.S.; Martha J. Roberts, Pharm.D. (RISHP) ; Richard I. Sakai, Pharm.D., FASHP, FCSHP; Ronald Schneider, B.S.Pharm., M.H.A.; Paul Seelinger, B.S.Pharm.; Suzanne Shea, M.B.A.; Armen Simonian, Pharm.D.; Kirby K. Stiening, B.S.Pharm.; George Taniguchi, Pharm.D., M.P.H., M.A.; Greg Teale, Pharm.D.; Jennifer Thomas, Pharm.D.; Melanie J. Townsend, Pharm.D., BCPS; Dennis A. Tribble, Pharm.D.; Chris L. Tucker, B.S.Pharm.; Chris Urbanski, M.S.; Allen J. Vaida, Pharm.D., FASHP (ISMP); Rayburn B. Vrabel, Pharm.D.; Kelley A. Wasicek, B.S.Pharm.; and Jody Jacobson Wedret, FASHP, FCSHP.

selected functions, and evidence of success or failure of manual processes to deliver the correct medication.

Bar-code verification is optimized, and its potential negative impacts on productivity minimized, when the scanning system is configured to use bar codes on bulk packages (e.g., the bar code on an unopened case of unit-dose-packaged tablets) to confirm the contents of each item in the case, especially during batch processes. For patient-specific doses, each individual container used for the dose must be scanned.

The equipment and training costs for a pharmacy-based bar-code scanning implementation is quite small, especially when compared to those of BCMA systems.[7] Pharmacy-based bar-code scanning implementation may be considered a prerequisite for BCMA success, because unreadable bar codes are a significant cause of BCMA implementation failures.[8,9]

Limitations

As with BCMA, adoption of bar-code scanning within distribution processes creates the necessity to ensure that the scanning system will recognize and appropriately respond to every bar code it scans. This verification activity is likely to create significant additional work for the pharmacy. Pharmacies planning on implementing such systems must plan for the resources needed to ensure that properly bar-coded products are presented to, and readable by, the scanning system.

In addition, as with other bar-code technology implementations, pharmacy-based bar-code scanning systems will only be beneficial if appropriately deployed. For example, given the need to scan three vials of medication to prepare an IV admixture, such a system cannot distinguish between scanning each vial and scanning the same vial three times, although the latter defeats the purpose of the scanning. Any program of pharmacy-based bar-code scanning should be accompanied by appropriate training, policies, and procedures to promote and optimize safe use of the system, as well as a regular program of auditing to ensure that the program is being properly deployed by staff. Additionally, such programs require hospitals and health systems to compile and maintain a complete database of bar codes in use throughout the institution. The availability of such information in a timely fashion is a well-recognized problem.[10] An incomplete database or the absence of bar codes on drug products can undermine the entire system, as the system cannot properly recognize and evaluate the drug products being scanned. Procedures should address such issues as the expected behavior while scanning occurs, specific prohibited acts, and the penalties associated with known at-risk behavior.[11]

In addition, this statement should not be interpreted to express a preference for bar-code scanning over other forms of automated identification of medications. Currently, bar coding is the least-expensive mechanism to introduce and deploy throughout the medication management cycle.[12] Should other technologies (e.g., radio-frequency identification) demonstrate similar or better capabilities, the principles articulated in this statement will continue to apply.

Validation

As with all such systems, bar coding on dispensing presumes that the scanning software, the scanning hardware, and the associated underlying database are accurate and complete. To ensure accuracy and completeness, organizations using a bar-coding process will need to validate both that the software operates as expected and that the underlying database information is correct and reliable. A process will also need to be in place to immediately remediate problems if it is discovered that the hardware, software, or database are not operating properly.

Conclusion

Prudent use of bar-code scanning in inventory management, dose preparation and packaging, and dispensing of medications can enhance patient safety and the quality of care. Such scanning also provides the opportunity to accumulate and use statistics on the pharmacy distributive operation that can direct more appropriate staffing, identify sources of routine error, and generally permit better management of the drug distribution process.

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