

# ASHP Statement on Bar-Code-Enabled Medication Administration Technology

## Position

The American Society of Health-System Pharmacists (ASHP) encourages health systems to adopt bar-code-enabled medication administration (BCMA) technology to improve patient safety and the accuracy of medication administration and documentation. To support the goal of having all medications electronically verified before they are administered, BCMA systems should be used in all areas of health systems in which medications are used. Pharmacists must be involved in the interdisciplinary planning, development, implementation, and management of BCMA systems and must ultimately be responsible for developing and maintaining the infrastructure required to ensure BCMA success. Health systems deploying BCMA programs must provide the funding and staffing necessary to permit pharmacists to fulfill this role.

ASHP urges the Food and Drug Administration (FDA) and other regulatory agencies, standard-setting bodies, contracting entities, health systems, and others to mandate that pharmaceutical manufacturers use symbologies that are readily deciphered by commonly used scanning equipment to code for the National Drug Code (NDC), lot number, and expiration date on all unit dose, unit-of-use, and injectable drug packaging. Pharmaceutical manufacturers should also provide all medications used in health systems in unit dose packages. FDA, pharmaceutical manufacturers and packagers, and the manufacturers of BCMA systems should collaborate to minimize or eliminate the causes of false rejection of valid medication doses. Certain characteristics of the current NDC identification system contribute to the burden of implementing BCMA systems, and ASHP urges stakeholders to participate in efforts to develop a system that more reliably identifies the unique drug (or combination of drugs), strength, dosage form, and route of administration.

Although bar-coding systems are currently a widely used point-of-care technology, ASHP recognizes that other types of machine-readable coding (e.g., radio-frequency identification) may evolve. ASHP supports the use of new technologies that are as effective as or improve upon existing systems and believes the principles outlined in this statement apply to such systems. ASHP urges further research on such systems as well as research that will definitively determine the extent to which BCMA systems reduce preventable medication errors and provide a financial return on investment for health systems.

## Background

Since the 1980s, health care practitioners and policymakers have recognized the potential benefits of using bar-coding technology in the medication dispensing and administration process.<sup>1-5</sup> Although there is a consensus of professional judgment and expert opinion on the advancement of BCMA technology, more studies are needed to definitively determine the impact of BCMA systems on medication errors and the finances of health systems. ASHP believes that optimally

implemented BCMA systems have tremendous potential to improve patient safety. In addition, the reengineering of the medication-use process required to implement a BCMA system can provide opportunities for performance improvement in patient care and clinical documentation.

A 2005 ASHP survey estimated that only 13.2% of hospitals used a BCMA system.<sup>6</sup> Although this percentage is small, it represents an almost 10-fold increase since 2002.<sup>7</sup> The rapid adoption of BCMA systems presents challenges to health systems, and ASHP believes that pharmacists have a crucial role in responding to those challenges.

## Role of the Pharmacist

Pharmacists should take the lead in ensuring that the implementation of BCMA systems and the reengineering of the medication-use system address the complexities of the process and that the goal of improving patient safety is achieved. Poor design and inadequate planning can compromise the effectiveness of a BCMA system and may even introduce new sources of error into the medication-use process.<sup>8</sup> Growing experience with BCMA systems has produced a body of knowledge that will aid hospitals and health systems in the adoption of BCMA systems.<sup>9-12</sup>

Pharmacy leadership needs to engage the chief information officer, chief nursing officer, and other key stakeholders in planning for BCMA systems as early as possible. Pharmacists and nurses should be involved with the pre-installation evaluation and selection of the BCMA system. Allowing end users to provide crucial advice about system design will increase acceptance and utility of the system.

Implementation of a BCMA system must be accompanied by the development of policies and procedures that ensure the system's safety. These policies and procedures should be developed by an interdisciplinary team that includes pharmacists.<sup>10</sup> Pharmacists and nurses should be involved with postinstallation evaluation and system improvement.

The role of nurses as end users of this technology should not be underestimated; nursing involvement is essential to successful system implementation and use. Processes for delivery and storage of medications (e.g., in medicine rooms or bedside storage spaces) should be examined by pharmacists and nurses to avoid workarounds or diversion.

## Elements of a BCMA System

Although every hospital and health system will need to develop a BCMA system that meets its own needs, the following general principles should guide the implementation and use of such systems.

Use of the BCMA system should be universal within the health system. To the fullest extent feasible, every patient, care provider, and medication should receive a unique identifier, and that identifier should be used not only to verify care prescribed for a patient but also to document every significant step in the medication-use process.

A process should be in place to ensure simple, secure, and controllable placement and replacement of a patient identification tag. To ensure that there is only one active wristband per patient, this process should discourage the printing of multiple labels.<sup>12</sup> In addition to appropriate human-readable information, machine-readable patient wristbands should contain information (e.g., a photograph or the patient's medical record number) in order to uniquely identify the patient.

The BCMA system should have a secure user-identification system. Every care provider should be assigned and use a unique identifier. The care provider administering a medication should be able to use the BCMA system to verify that the medication to be administered is appropriate for the patient (i.e., confirming that the five rights of medication administration<sup>13</sup> are met). The BCMA system should document the information in the electronic medication administration record.

The pharmacy must be able to ensure that doses received in patient care areas can be scanned without inappropriate rejection and that those scans reliably indicate whether the medication is appropriate for a particular patient. For the implementation of a BCMA system to succeed, the health system must commit the pharmacy resources necessary to verify that each incoming medication is scannable and that the data encoded within its bar code accurately represent the product.

Every medication possible should be packaged in unit doses, and each unit dose package should be labeled with both human-readable medication identification information and a machine-readable code that includes the medication's unique identifier and, when feasible, its lot number and expiration date. Pharmacy information systems must be able to generate bar codes for multiple-component items. Pharmacy departments must develop a validation process for ensuring that every item has a bar code that can be scanned by all equipment supporting the BCMA system, including pharmacy automation systems, automated medication storage and distribution devices, and nursing BCMA scanning units.

An adequate number of scanners should be provided for each patient care area to facilitate scanning at peak times. Scanners should have the capacity to autodiscriminate the variety of symbologies encountered on pharmaceutical and pharmacy-prepared containers.

Finally, contingency plans should exist to ensure patient safety during system downtime. These policies should require that medications administered during downtime are retrospectively documented electronically in the medical record so that decision-support systems accurately reflect clinical trends associated with the patient, medication administration, and medication effects.

## Conclusion

ASHP encourages health systems to adopt BCMA technology, with the goal of having all medications electronically verified before they are administered. Pharmacists must ultimately be responsible for developing and maintaining the infrastructure necessary to ensure BCMA success, and health systems deploying BCMA systems must provide the funding and staffing necessary to permit pharmacists to fulfill this role.

ASHP believes that pharmaceutical manufacturers should be required to place machine-readable coding that includes the NDC, lot number, and expiration date on all unit dose, unit-of-use, and injectable drug packaging, using symbologies that are readily deciphered by commonly used scanning equipment. ASHP also urges further research that will definitively determine the extent to which BCMA systems reduce preventable medication errors or provide a financial return on investment for health systems.

## References

1. Hokanson JA, Keith MR, Guernsey BG et al. Potential use of barcodes to implement automated dispensing quality assurance programs. *Hosp Pharm.* 1985; 20:327–37.
2. Nold EG, Williams TC. Barcodes and their potential applications in hospital pharmacy. *Am J Hosp Pharm.* 1985; 42:2722–32.
3. Barry GA, Bass GE, Eddlemon JK et al. Bar-code technology for documenting administration of large-volume intravenous solutions. *Am J Hosp Pharm.* 1989; 46:282–7.
4. Lefkowitz S, Cheiken H, Barhart MR. A trial of the use of bar code technology to restructure a drug distribution and administration system. *Hosp Pharm.* 1991; 26:239–42.
5. Meyer GE, Brandell R, Smith JE et al. Use of bar codes in inpatient drug distribution. *Am J Hosp Pharm.* 1991; 48:953–66.
6. Pedersen CA, Schneider PJ, Scheckelhoff DJ. ASHP national survey of pharmacy practice in hospital settings: dispensing and administration—2005. *Am J Health-Syst Pharm.* 2006; 63:327–45.
7. Pedersen CA, Schneider PJ, Scheckelhoff DJ. ASHP national survey of pharmacy practice in hospital settings: dispensing and administration—2002. *Am J Health-Syst Pharm.* 2003; 60:52–68.
8. Patterson ES, Cook RI, Render ML. Improving patient safety by identifying side effects of introducing bar coding in medication administration. *J Am Med Inform Assoc.* 2002; 9:540–53.
9. Patterson E, Rogers M, Render M. Fifteen best practice recommendations for bar-code medication administration in the Veterans Health Administration. *Joint Comm J Qual Saf.* 2004; 30:355–65.
10. Neuenschwander M, Cohen MR, Vaida AJ et al. Practical guide to bar coding for patient medication safety. *Am J Health-Syst Pharm.* 2003; 60:768–79.
11. ASHP Research and Education Foundation. Implementing a bar-coded medication safety program: a pharmacist's toolkit. [www.ashpfoundation.org/MainMenuCategories/Education/SpecialPrograms/ImplementingaBarCodedMedSafetyProgram.aspx](http://www.ashpfoundation.org/MainMenuCategories/Education/SpecialPrograms/ImplementingaBarCodedMedSafetyProgram.aspx) (accessed 2008 Dec 3).
12. Cummings J, Bush P, Smith D et al. Bar-coding medication administration overview and consensus recommendations. *Am J Health-Syst Pharm.* 2005; 62:2626–9.
13. 10 Golden rules for administering drugs safely. In: McGovern K. Preventing medication errors. Springhouse, PA: Springhouse; 1994:2–3.

## Suggested Readings or Other Resources

- ASHP guidelines on preventing medication errors in hospitals. *Am J Hosp Pharm.* 1993; 50:305–14.
- Aspden P, Wolcott J, Bootman JL et al., eds. Preventing medication errors: quality chasm series. Washington, DC: National Academies Press; 2007.
- Cohen MR, ed. Medication errors. Washington, DC: American Pharmaceutical Association; 1999.
- Johnson CL, Carlson RA, Tucker CL et al. Using BCMA software to improve patient safety in Veterans Administration medical centers. *J Healthc Inf Manage.* 2002; 16:46–51.
- Leape LL. Error in medicine. *JAMA.* 1994; 272:1851–7.
- Poon EG, Cina JL, Churchill W et al. Medication dispensing errors and potential adverse drug events before and after implementing bar code technology in the pharmacy. *Ann Intern Med.* 2006; 145:426–34.
- Puckett F. Medication management component of a point of care information system. *Am J Health-Syst Pharm.* 1995; 52:1305–9.
- 
- Developed through the ASHP Section of Pharmacy Informatics and Technology and approved by the ASHP Board of Directors on March 7, 2008, and by the ASHP House of Delegates on June 10, 2008. Supersedes ASHP policy position 0308.
- Copyright © 2009, American Society of Health-System Pharmacists, Inc. All rights reserved.
- Arash T. Dabestani, Pharm.D., M.H.A. and Alicia B. Perry, Pharm.D., are gratefully acknowledged for drafting versions of this statement.
- The bibliographic citation for this document is as follows: American Society of Health-System Pharmacists. ASHP statement on bar-code-enabled medication administration technology. *Am J Health-Syst Pharm.* 2009; 66:588–90.