Bar Coding: Medication Administration System – Using

What Is Using a Bar Code Medication Administration System?
› Medication errors are a significant source of increased patient morbidity and mortality, healthcare costs, and length of stay. Nurses are generally the final point of contact to correct an error prior to medication delivery. Bar code medication administration (BCMA) systems are an effective method for decreasing patient misidentification and medication errors. This *Nursing Practice & Skill* is intended to provide an overview of BCMA systems and describe their overall use; it is not intended to replace manufacturer’s instructions or unit/facility protocols specific to the BCMA system in use at any specific health care facility. *(For information on implementing a bar code system, see *Nursing Practice & Skill* ... Bar Coding Systems: Implementing *)

• *What:* Using a BCMA system involves the use of specialized scanners *(Figure 1)* and software that is able to recognize a unique identifying bar code on the patient’s wrist band *(Figure 2)* and match it to a bar coded label on a medication *(Figure 3)* to verify that the right patient is receiving the right medication, at the right dose, in the right form, and at the right time (i.e., the 5 “rights” of medication administration)

![Figure 1: A hand-held barcode scanner is used to verify patient identity when administering medications, obtaining specimens, and performing blood transfusions. Copyright© 2016, EBSCO Information Services](image-url)
Figure 2: Patient’s identification wrist band with barcode.  
Copyright © 2014, EBSCO Information Services.

Figure 3: Medications can be packaged with a barcode that is scanned and compared against the patient’s barcoded wrist band and electronic medication administration record (eMAR). Copyright © 2016, EBSCO Information Services

- **How:** Using a BCMA system requires
  - the collaboration of pharmacy and nursing services
  - specialized equipment, including scanners to read bar codes, software to allow matching of wrist band bar codes with bar coded medication, the bar coded patient wrist bands, and the bar coded medications
  - training of healthcare personnel on the use of the BCMA system
  - ongoing evaluation and support
- **Where:** BCMA systems can be used in all inpatient and outpatient care settings where medications are administered
- **Who:** BCMA systems are used by all healthcare personnel who are licensed to administer medication, including registered nurses, licensed vocational nurses, and physicians; the use of BCMA systems cannot be delegated to assistive staff members (e.g., nursing assistants) who are not licensed to administer medication

**What Is the Desired Outcome of Using a Bar Code Medication Administration System?**

- Consistent and correct use of a BCMA system can result in decreased medication errors and increased overall patient safety

**Why Is Using a Bar Code Medication Administration System Important?**

- Healthcare institutions are mandated to promote patient safety and to have policies and procedures in place that are intended to reduce adverse healthcare events, including medication errors
• Decreasing medication errors will reduce patient morbidity, patient mortality, healthcare costs, and length of stay, which are often increased as a result of medication errors
• BCMA systems are an effective method for preventing medication errors
  › The Joint Commission’s National Patient Safety Goal 1 (NPSG.01.01.01) requires verification of patient identity through the use of at least two patient identifiers prior to performing any treatment in order to prevent the occurrence of adverse healthcare events, including medication errors, as a result of patient misidentification (The Joint Commission, 2016)

**Facts and Figures**

› According to the Institute of Medicine (IOM), it is estimated that
  • the average hospital patient can expect to experience > 1 medication error/day
  • 1.5 million preventable medication errors occur in hospitals in the United States each year
  • the annual cost of preventable medication errors among hospitalized patients in the U.S. is $3.5 billion (Institute of Medicine, 2006)

› Although implementation of a BCMA system can cost an average of $40,000 per BCMA-enabled bed, the presence of a BCMA system can significantly decrease medication errors and result in an estimated cost savings of $1,100–5,400 per harmful medication error averted (Sakowski et al., 2013)

› Two-thirds of all hospitals in the U.S. currently use BCMA systems, up from 3% in 2001 (Crist, 2014)

› In a study of 775 BCMA systems, researchers found that the technology improved patient safety by decreasing the rate of medication and transcription errors (Truitt et al, 2016)

What You Need to Know Before Using a Bar Code Medication Administration System

› Medication errors can occur as a result of errors in transcription or as a result of errors in administration
  • BCMA systems are designed to prevent errors in medication administration and promote patient safety by matching the right patient with the right drug, at the right dose, using the right route, and at the right time
  • BCMA systems are more effective at preventing medication errors than visual checks of the medication by pharmacists
  • BCMA systems are implemented in conjunction with an electronic medication administration record (eMAR), which
    • lists the patient’s medications, including the medication name, dosage, route, frequency, and indication
    • provides access to an electronic drug reference source listing common dosages, indications, contraindications, and any special administration considerations (e.g., the need for monitoring blood levels of a drug) for each medication; an image of the medication might also be provided
    • can be automatically updated as new clinician orders are entered in the electronic system, which can reduce medication transcription errors

› The advantages of using a BCMA system vary according to the specifics of the system design; common advantages are that the BCMA system
  • reinforces patient identification and specific information related to patient care
    – When the bar code on the patient’s wrist band is scanned, the screen displays basic patient information, the patient’s eMAR, and the patient’s known allergies
    - The medications are displayed in chronologic order and might be highlighted according to the time they are to be given (e.g., medications to be given now might be highlighted in yellow)
    - When using a BCMA system, it is necessary to confirm the patient’s identity using one other identifier (e.g., asking a patient who is alert his or her name) and to verify allergies by one other method (e.g., checking for an allergy wrist band) according to unit or facility protocol
  • provides a warning if a medication is scanned that is not included on the patient’s eMAR or if the patient is allergic to the scanned medication
  • facilitates nursing workflow and allows more time for nurses to provide patient care and perform unit activities
    – Nurses do not have to spend time manually transcribing medication orders or checking for new medication orders because the eMAR updates automatically as soon as a new order is entered
  • automatically documents in the eMAR when a medication is administered
  • increases nursing satisfaction with regard to the ease of verifying the 5 rights of medication administration
    – Historically, nurses reported dissatisfaction with delays in receiving stat medications and being able to immediately administer them
Barriers to BCMA system use include:

- Wireless network disconnection and breakdowns
  - Hard copies of the eMAR should be printed at the start of each shift for use as a backup in case of a system failure
- Equipment breakdowns
  - It is important that the facility have replacement equipment that is readily available
- A lack of bar codes on all medications
  - Pharmacies often have to purchase a medication relabeling system and employ workers to relabel medications that lack a bar code label
  - Some facilities elect to not apply bar codes to medications that do not come with bar codes if the medications have low risk for adverse events
- A bar code on a wrist band that will not scan
  - Wrist bands should be replaced routinely in long term care settings and as needed in acute care settings
- A wrist band mistakenly given to the wrong patient
  - A secondary method of identification, such as verbally confirming an alert patient’s name, should also be used when possible
  - Extra care should be taken during check-in to ensure the patient has the correct wrist band
- The need to routinely clean BCMA equipment to prevent cross infection
  - Patients in isolation should have a dedicated computer station and the scanner in the patient’s room or the handheld scanner should be covered with a plastic cover that is discarded following use and the scanner cleaned
- The lack of sufficient training in the use of the BCMA system
  - An interdisciplinary oversight group (IOG) should be formed to oversee the implementation of the BCMA system
  - Super users (i.e., personnel who are passionate about and eager to adopt a bar coding system) should be trained first by the vendor, and the super users should train other healthcare personnel on the use of the system
    - The IOG should request and take into account feedback from super users in order to adjust the BCMA system early to fit the hospital’s needs and create a smoother transition for everyone to implement the BCMA system
  - Training should be thorough and geared to the level of comfort of the person’s previous experience with computers and computer systems; training should include:
    - A didactic component in which the use of the system and the benefits of the system with regard to improving patient safety are emphasized
    - An opportunity to use a mock-up of the bar coding system (e.g., simulate administering a medication using the system)
    - Additional time for personnel who do not demonstrate competency
    - Ongoing training as changes and enhancements are made to the system
    - Placement of reference charts on the unit for easy reference
    - Feedback from all users, including those unhappy with the BCMA system
- Nurse workarounds (i.e., methods for administering medications that adapt or override use of the procedures dictated by the BCMA system)
  - Common workarounds include creating a duplicate copy of the patient’s wrist band that is taped to the chart and scanning that or the bar code on the patient’s chart prior to medication administration rather than following the BCMA procedure of scanning the wrist band that is on the patient’s wrist
  - Some nurses use workarounds to prevent having to disturb the patient (e.g., when hanging IV medications), but any workaround can place the patient at increased risk for medication errors
  - Special accommodations will have to be made for patients who are unable to wear a wrist band (e.g., a psychiatric patient who continually removes wrist band, or an amputee patient)
  - A nurse can be held legally liable for any patient injury incurred following medication administration if there is a BCMA system in place and he/she used a workaround
  - If nurses are satisfied with how a BCMA system fits into their workflow, they are less likely to create workarounds
  - Workarounds are not the same as “tinkering” during the training phase of a BCMA system; during training and implementation, nurses may deliberate the best way to tailor the BCMA to each patient and will submit this as feedback about the system. This tinkering only becomes a workaround if the nurse continues to adapt the system following its implementation and standardization

Medication errors—such as patient receiving the wrong medication, in the wrong dose, and/or at the wrong time—can occur with use of a BCMA system as follows:

- The medication is administered prior to scanning the patient’s wrist band
• The medication is mislabeled with either the incorrect medication name or an incorrect dosage of the correct medication
  – Mislabeling is more likely to occur if the medication had to be relabeled in the pharmacy
  – The nurse administering the medication should do a visual check of the 5 rights of medication administration rather than relying completely on the BCMA system
  – It is important to check the medication if the patient states that a medication looks different than how it usually looks (e.g., a different color)
• The nurse administering the medication overrides error warnings (e.g., ignores an allergy warning) or works around the BCMA system
• A hard copy MAR is used in addition to the eMAR
  – The extra time involved in double documentation will promote the nurse using one system or the other (i.e., either using the BCMA system with the eMAR or avoiding use of the BCMA system and recording medication administration manually on the hard copy MAR) and places the patient at increased risk of having medications overlooked or administered twice
  A BCMA system cannot prevent a patient from receiving a medication that he or she is allergic to if the patient has not previously demonstrated an allergy to the medication and/or does not have the allergy documented in the patient’s medical record (e.g., the patient experiences his or her first allergic reaction to a medication)
• Prior to administering any medication, the nurse should review
  • the 5 rights of medication administration
  • unit/facility protocols for administration of the medication, if available
  • the treating clinician’s order for the medication
  • the patient’s medical record/medical history for indications for the medication and any contraindications (e.g., allergy) to administration of the medication
  • instructions for the BCMA equipment to be used and verify that the equipment is in good working order
  • the facility- and/or unit-specific protocol for using the BCMA system, if available
• Equipment that is typically needed for use of a BCMA system includes the following:
  • Bar coded patient wrist bands
  • Bar coded medications
  • Bar coded identification badge (to identify the nurse administering the medication)
  • Hand-held or other scanning device
  • Hardware and software to read and manage the BCMA and eMAR systems
  • A wireless computer network system sufficient for managing a bar coding system
  • Nonsterile gloves and other personal protective equipment (PPE; e.g., gowns) if exposure to body fluids anticipated

How to Use a Bar Code Medication Administration System

› Perform hand hygiene
› Identify the patient according to facility protocol
› If appropriate, establish privacy by closing the door to the patient’s room and/or drawing the curtain surrounding the patient’s bed
› Introduce yourself to the patient and family member(s), if present, and explain your clinical role; assess the patient and family for knowledge deficits and anxiety regarding the medication to be administered and use of the BCMA system
• Determine if the patient/family requires special considerations regarding communication (e.g., due to illiteracy, language barriers, or deafness); make arrangements to meet these needs if they are present
  – Follow facility protocols for using professional certified medical interpreters, either in person or via phone, when language barriers exist
• Explain the purpose of the medication to be administered and the use of the BCMA system; answer questions and provide additional information and emotional support as needed
› Obtain verbal consent to administer the medications
› Bring the scanning system, computer, and medication into the patient’s room if not already present
› Don PPE (e.g., gloves) if exposure to body fluid anticipated
› Scan your identification badge and enter a password as prompted by the computer screen, if indicated
› Scan the patient’s wrist band to bring up the patient’s eMAR on the screen
• A screen might appear asking the nurse to confirm
  – new or discontinued medications
Select the medication to be administered from the eMAR, and scan the label on the medication container
• If a warning message appears on the screen, follow the instructions provided before continuing with medication administration
• If the medication does not have a bar coded label, manually enter the medication name, dosage, route, and time of administration in the system
Verify that the information on the eMAR computer screen is correct by visually performing the 5 rights of medication administration
• If any of the 5 rights are not corroborated, hold administration of the medication until the discrepancy is resolved
Prepare the medication for administration and administer the medication
Confirm on the eMAR computer screen that the medication was administered in order to update the eMAR
If the medication is not administered (e.g., because the wrong dosage was sent from the pharmacy or as a result of patient refusal to take the medication) document on the eMAR computer screen that the medication was not administered and the reason
• Many systems have a drop-down screen from which to select the reason for not administering a medication
Remove and discard PPE, if used, and perform hand hygiene
Update the patient's plan of care, as appropriate, and document patient information relevant to medication administration in the patient's medical record if indicated; documentation might include
• serum medication levels prior to medication administration (e.g., the patient’s PT prior to administering warfarin)
• any blood specimens drawn prior to or following medication administration (e.g., drawing a serum antibiotic trough level prior to administration)
• serum blood glucose level prior to insulin administration
• heart rate prior to digoxin administration

Other Tests, Treatments, or Procedures That Might Be Necessary Before or After Procedure
• Ongoing education of healthcare personnel will be needed as changes and updates are made to the bar coding system
• At the end of each shift, the nurse might be required to print a report listing any near-miss medication errors according to unit/facility protocol

What to Expect After Using a Bar Code Medication Administration System
• The unit and facility will demonstrate a reduction in medication errors and an increase in overall patient safety following consistent and correct use of a BCMA system

Red Flags
• Bar coding systems can be worked around by healthcare personnel, which can increase the risk for patient misidentification and medication errors; nurses who work around an established bar coding system are legally liable for patient injury incurred related to the medication
• Mislabeled bar codes on medications, wrist bands that are difficult to scan, and confusing computer screen displays can result in technology-related adverse healthcare events

What Do I Need to Tell the Patient/Patient’s Family?
• The patient and family should be reassured that the use of bar coding will increase patient safety and that no information is gathered about the patient during the use of the bar coding system other than to match the patient with the correct medication
• The patient’s bar coded wrist band must be scanned prior to any medication administration even if the patient is sleeping, including hanging a new bag of IV fluid

References


