

**Best Practice Recommendations
for the Implementation and Use of
Bar Code Medication Administration (BCMA)**

VA Midwest Patient Safety Center of Inquiry
(GAPS Center)

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The team would like to thank those who contributed to this report by openly discussing with us and letting us observe how they use BCMA in their hospital and how they think they would use a prototype of BCMA before implementation during usability tests. Open discussions are critical to the mission of the Veteran's Administration – providing safe, high-quality healthcare to veterans and serving as a leader in the patient safety movement by sharing lessons learned with other healthcare organizations.

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Executive Summary

Barcode scanning is the oldest machine-readable identification system and has been widely used in a variety of industries. Compared to typing, which produces about 1 error every 300 keystrokes, barcode scanning error rates range from 1 character in 15,000 to 1 in 36 trillion. Software built upon barcode scanning for patient and medication information has the potential to greatly reduce medication errors by scanning barcoded wristbands and labels to verify that the intended patient is getting an actively ordered medication in the correct dose at the scheduled time immediately prior to administration.

As with any software package, effectiveness is dependent upon a myriad of design, implementation, and maintenance choices. For example, if tethered scanners are placed on medication carts that do not fit into a patient’s room, the wristband cannot be scanned to identify the patient. In addition, the introduction of any new technology, regardless of how effective, will have negative “side effects” that were not anticipated in advance due to the complex, interconnected nature of medication administration. These side effects may lead to new paths to adverse events, some of which may be avoided through redesign or use of “best practices.”

The Veteran’s Health Administration has learned much about how to use Bar Code Medication Administration (BCMA) effectively since the mandated national implementation in 2000. In this report, we recommend 15 practices that are intended to maximize the effectiveness of the use of Bar Code Medication Administration in reducing iatrogenic injury to patients (Table 1). For each practice, we describe the rationale for the recommendation and detail the supporting research data.

| Topic | Best Practice Recommendation |
|---------------------------------------|---|
| Implementation/continuous improvement | 1. Standing interdisciplinary committee |
| Training | 2. Train all nurses; cross-train others |
| Troubleshooting | 3. Communicate known problems 4. Contact information for types of problems |
| Contingency planning | 5. No “double documentation” as a backup 6. Schedule downtimes to minimize disruptions |
| Equipment maintenance | 7. Swap broken equipment with backup unit 8. Procedures to clean equipment |
| Medication administration | 9. Scan barcoded wristbands and medications 10. Caregiver documents at time of administration 11. Verify allergy information displayed in BCMA 12. Use printed worksheet as overview 13. Print “missed meds report” once a shift 14. Alert nurses to new STAT orders |
| Wristband maintenance | 15. Periodic replacement of wristbands |

Table 1. Summary of recommendations

Although we feel that these “best practice” recommendations might be of interest to non-VA hospitals, they are designed around the specific characteristics of the BCMA software and the Veteran’s Health Administration infrastructure. In addition, note that these recommendations have not been rigorously evaluated for their efficacy in improving quality of care or reducing iatrogenic injury.

Note that every “best practice” is not going to apply to every situation due to context-specific variables. “100% compliance” is not a goal due to these context-specific factors. Nevertheless, generating metrics and monitoring improvement in metrics in relation to benchmarks is likely to be useful in improving patient safety. Creating these metrics is beyond the scope of this project.

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Methodology

OUR OBJECTIVES ARE TO:

- Recommend “best practices” to reduce the potential for predictable paths to new forms of adverse outcomes
- Share “lessons learned” about the implementation and use of bar code medication administration systems to improve patient safety

OUTLINE OF METHODOLOGY:

- Direct observation of medication administration:
 - 21 hours of observation of 7 nurses at 1 medium hospital (~9000 admissions/year) on acute care wards prior to BCMA implementation
 - 25 hours of observation of 5 nurses at 1 large hospital (>12,000 admissions/year) in the ICU prior to BCMA implementation
 - 24 hours of observation of 10 nurses at 1 small hospital (<3000 admissions/year) on acute care and long-term care wards after BCMA implementation
 - 48 hours of observation of 19 nurses at 1 medium hospital (~9000 admissions/year) on acute care and long-term care wards after BCMA implementation
 - 33 hours of observation of 8 nurses at 1 large hospital (>12,000 admissions/year) on acute care and long-term care wards after BCMA implementation
- Usability testing of Bar Code Medication Administration (BCMA)
 - V1.0 August 28-29, 2001; 5 nursing participants
 - V2.0 November 26-27, 2001; 5 nursing participants
 - V2.0 Revised Interface, January 23-24, 2002; 4 nursing participants
 - V2.0 Med Order Button function June 4, 2002; 2 nursing participants
 - Handheld version - Wireless Medication Administration (WMA); 5 nursing participants
- E-mail responses about hospital policies for challenging issues from nursing ADPACs
 - 16 VA hospitals
 - 2 non-VA hospitals
- Feedback on proposed recommendations from VA personnel (nurses, pharmacists, Information Resource Manager), and non-VA personnel (patient safety expert, nursing professor, representatives from 3 hospitals with a commercial vendor product)

LIMITATIONS OF THE METHODS:

- Best practice recommendations were not tested for efficacy in improving quality of care or reducing iatrogenic injury.
- Recommendations are based upon current system design – future changes, such as the use of a planned electronic “cover sheet”, will change the recommendations and render some recommendations obsolete. In addition, they may not apply to hospitals using other bar-code based medication administration software
- Minimal research with non-nursing personnel (pharmacists, respiratory therapists, risk managers, physicians) was conducted

PARTICIPATION:

The study was approved by the Institutional Review Boards (IRBs) at all participating facilities and formal consent obtained. All individuals and sites are de-identified and names are not captured or retained by the GAPS Safety Center.

“Best Practice” Recommendations

1. Put in place a standing interdisciplinary committee.

The committee should implement and to proactively conduct continuous improvement on BCMA implementation and use. One method for obtaining feedback should include rounds on the floors on a frequent and continuous basis (e.g., weekly or biweekly) by an interdisciplinary team (nursing, pharmacy, IRM, and, when possible, biomed representatives). Actions taken to address problems should be reported back to end users (e.g., through e-mail, handouts).

- **Rationale:** Integrating BCMA into medication administration is extremely complex and requires changes to how work is conducted by many personnel in addition to the nurses at the bedside (e.g., pharmacists, respiratory therapists, physicians, nurse’s aides, nursing ADPACs, pharmacy ADPACs, nursing educators, Information Resource Managers (IRM), risk managers, patient safety coordinators). In order to be effective, continuous interdisciplinary communications are required to implement and resolve issues as they arise. Proactive attempts to solicit feedback and improve systems will reduce strategies that circumvent the system, thereby improving the patient safety benefits from using the software.
- **Supporting data:**
 - “Assessing Bedside Bar-Coding Readiness” by the American Hospital Association, Health Research and Educational Trust, and Institute for Safe Medication Practices (<http://www.ismp.org/Pages/MSK.html>) recommend: “Establish a multidisciplinary team with broad representation...each hospital needs to carefully consider what constituencies should be represented...”
 - VA Hospital 1: [We troubleshoot by] “making rounds on the floors talking to med nurses...The feedback from staff is ongoing, we have a very verbal staff. When version 2 came down it show staff that many of their ideals were incorporated in the new version. Also this is an agenda item at the Nursing Informatics Council... The original team included staff from many services - nursing, pharmacy, OIM, chief of staff, engineering, union, and mental health. First the Assistant Director was chair, then the ACN for Operations now the Pharmacy ADPAC. The Assistant Director retired so the Associate Director is on the mail groups so he can keep tabs on what is going on. When we need help from one of them we just tell them what we need. The BCMA team is still intact, even though some service don't attend regularly, but they remain on the mail groups so they get the info.”
 - VA Hospital 2: “Superusers have a mail group and also, all staff feel comfortable sending e-mail info to educator and myself.”
 - VA Hospital 3: “We designed a BCMA Trouble Log Sheet for feedback on problems. We do get feedback from clinical specialists and from staff and submit E3R and NOIS as appropriate.”
 - VA Hospital 4: “BCMA problems are identified thru daily rounds by ADPACs, on the spot checks & interviews with users and the monthly BCMA taskforce meetings...Feedback is obtained from daily rounds and interactions with staff, faxing a problem log to the Nursing ADPAC and thru meetings with staff. Notification of software upgrades is done thru VISTA & Outlook.”
 - VA Hospital 5: “We troubleshoot difficulties in the training room as a group: including ADPACs, Nursing Education staff, pharmacy and IRM staff...We work together to solve the problem. If needed: a NOIS is entered... We meet with super users monthly to try to get feedback from staff. We also make rounds on the units to speak to staff about suggestions.”
 - VA Hospital 6: “Super-users first line of defense, then if urgent they call her, if she is out, there is a another .50 FTE who is called, AOD called off-tours and then IRM is contacted.”

- VA Hospital 7: “Troubleshooting - For scanning problems, nurses have been asked to either call a "hot line" number in pharmacy or send an email to g.SCAN via vista; information to be included is the nurse, the patient and the medication. The group who responds to the scanning issues are inpatient pharmacists and the Pharmacy and Nursing ADPAC's. For other BCMA issues, the staff has a "cheat sheet" on each cart with names and numbers for specific issues (IE: IRM support for hardware, pharmacy for scanning and nursing ADP for software, or other undefined problems.)”
- VA Hospital 8: “Concerns are reported in e-mails, on reports of potential or actual drug events, and when the ADPAC or Special Projects coordinator see the bedside nurses while making rounds, troubleshooting, or teaching classes. During these interactions we reinforce that we need to hear the concerns before we can help. Our implementation group has been formally developed and meets on a weekly basis. The group is made up of Pharmacy, Nursing (Nurse Managers, Staff Nurses, ADPAC, Special Projects Coordinator), Patient Safety, and Clinical Coordinator. The Patient Electronic Record Information Team (PERIT) reviews all drug events (actual/potential for any process issues. Prior to the review at PERIT it is also reviewed by the Nurse Manager/Pharmacists for any immediate actions. The PERIT review is summarized and recommendations are made and go to Patient Medication Safety and Utilization and then to Pharmacy and Therapeutics Committee. We use e-mail and face-to-face contact to let them know what actions we have taken to resolve problems and what feedback we have received from the support staff when we report problems using NOIS. We let them know that we have filed E3R's to request the enhancements they have suggested to us.”
- VA Hospital 9: “We work closely with the staff on a daily basis. They call us as needed and as they identify needs for improvement, or as we do the same, we submit E3Rs. Most of the time the issues are already under discussion nationally...and we participate in the national conference calls, email groups, etc. We also coordinate all aspects of BCMA within the facility including other services, Pharmacy, IRM, A&MMS, etc., and try to make things work for all. We created a BCMA USERS email group since day one with Version 1 and use it to communicate to all involved.”
- VA Hospital 10: “Surveys from time to time and unsolicited info frequently. Staff have suggestions that are evaluated for E3R submission. We use email and notification to immediate supervisors for software upgrades and filing of requests for changes to software.”
- VA Hospital 11: “Troubleshooting is done daily and on an as needed basis. As the lone CAC for Patient Care Services, I'm often the only person doing routine checks of equipment functionality. With respect to issues involving use of the BCMA program, these are often directed to me as well...Invariably communication between the CAC and nursing staff is face-to-face, via electronic mail, and via paper correspondence. I certainly get remarks from staff regarding various aspects of BCMA, often they're negative but I do receive positive remarks as well. Depending on the degree of upgrade or expected modifications, usually staff are informed via electronic correspondence and open view flyers placed on the individual patient care units.”
- VA Hospital 12: “Core group of staff communicate findings and respond to questions. This group includes, Nursing Education Coordinator, (2) Nurses in Nursing informatics, Pharmacy Ad PAC (computer specialist), Inpatient Pharmacy Supervisor, Computer equipment specialist. Nurses are encouraged to contact any staff listed [above]. Also, staff pharmacist and Nurse Supervisor. Problems are handled in real time by any listed [above]. If unable to resolve there is a national help desk that is contacted for resolution. Patient safety alerts to all clinical users are sent if system problem is presently uncorrectable... Feedback is obtained by survey and individual interview. Staff is always ready to

make suggestions. Software improvements are unfortunately done when systems problem arise. Upgrades to software are slow. 1. Have staff on the BCMA committee 2. Formed a Nursing BCMA COMMITTEE to discuss nursing concerns 3. Mail group for them to send messages 4. Invite guests to BCMA committee meetings 5. Nurse managers and CNO attend staff meetings to bring back ideas. Notification - if not in a formal class, then handouts and e-mail notifications.”

- VA Hospital 13: “Informatics staff does rounds. Each staff member is responsible for notifying informatics staff about faulty equipment (or off tour coordinator on off tours)...We have monthly meeting Nurse-Pharmacy which includes reps from each clinical area and pharmacy. We also have email group and "BCMA rounds" to get input for recommended changes.”
- VA Hospital 14: “For any significant implementation, Clinical Informatics provides on-site 24/7 coverage. Clinical Informatics monitors performance reports looking at timeliness of administration, prn effectiveness, missed medications, etc. Clinical Informatics Nurse reviews all incident reports related to computer issue and presents at Electronic Medical Record Committee for discussion, system analysis, and recommendations. We conduct weekly interdisciplinary rounds to inpatient units to resolve BCMA issues and listen to nursing concerns. The rounds includes representatives from Pharmacy, Information Management and the Clinical Informatics Nurse. This has enabled direct dialogue among the key players in implementing and maintaining BCMA.”
- VA Hospital 15: “We have an e-mail group for BCMA issues that is used for meds that do not scan, etc. Also the staff freely contact myself, the informatics nurse or the pharmacy when they need immediate resolution. NOD's on off tours are expected to assist with troubleshooting and education also. The informatics team for BCMA (Nurse Informatics/Pharmacy Informatics) works together to test new patches, install, identify issues and work with IMS when needed for resolution... Rounds routinely made to gather input/feedback/assist staff by Informatics Nurse. Encourage staff to utilize the BCMA mailgroup for identification of issues. Formal process in VA to put in enhancement requests to software - goes to developers and all on the mailgroup where next other facilities respond with support or nonsupport and the reason. Staff usually notified via email of upgrade or are given simple screen captures of changes occurring for improvement.”
- VA Hospital 16: “Problems are identified by e-mails, telephone calls, verbal reports and monitoring of the system. Who is contacted is dependent upon what the problem is...IRM Clinical Applications Coordinators are now monitoring the CABG patient orders on a daily basis to make sure they are input correctly. This enables the nurses to scan the medications post-op. We have had several problems identified with this particular patient population. We have solved many issues but still continue to monitor the process. (By the way, the ICU uses a dual system in case there is a problem with BCMA). We have a BCMA Coordinating Committee (focus group) with representatives from Nursing, Pharmacy and IRM where problems are also identified and solutions are created... Feedback is obtained as indicated above via e-mails, verbal reports, and reports to the BCMA Coordinating Committee. We have submitted at least 2 E3Rs to recommend change in the package. If there is a major problem, our IRM staff has more than once called the National Help Desk. They always involve Nursing and Pharmacy as indicated. Notification of minor software upgrades occurs via e-mail. Major ones require classroom training... The importance of communication between IRM, Pharmacy and Nursing needs to be stressed. Nursing and Pharmacy need to understand what the other sees in relation to BCMA. Providers are also essential since BCMA is very dependent on order entry. “

2. Train all users. Cross-train pharmacists and physicians.

All personnel administering medications, medicated ointments, or respiratory treatments in VA hospitals need to receive significant training on BCMA software. Develop a process for updating personnel about software updates, particularly for “super-users” and temporary (“agency”) nurses. Cross-train pharmacists on the nursing features in BCMA and physicians on how to write orders that are compatible with the design of the BCMA software.

- **Rationale:** The BCMA software is sufficiently complex that new paths to medication errors can result from software use without adequate training. Use of backup systems, such as printed medication administration records (MARs), to administer medications in situations when the primary system is functional can lead to missed dose and double-dose errors and confusing gaps in the electronic documentation. It is particularly important that nurses who serve as resources to other nurses (*i.e.*, “super-users”) and temporary (“agency”) nurses are familiar with the latest changes to the software. In many hospitals, pharmacists help nurses to troubleshoot when medications do not scan as expected, and it is helpful for them to know the system as seen by a nursing user. The use of BCMA impacts how physicians need to write their orders in CPRS (e.g., “20MG” needs to be written as “20 MG”).
- **Supporting data:**
 - In an interview during observations, an agency nurse without training on BCMA software described that she was unhappy that she was being asked to perform “nursing assistant” duties since she was unable to pass medications. In another interview during observations, an agency nurse without training on BCMA described that she passed medications using the paper MAR rather than use a system with which she was unfamiliar.
 - During usability testing of a prototype of BCMA version 2.0 prior to implementation, 4/5 participants did not administer any ordered IV medications for at least one patient because they did not look on the IV tab. The one participant who administered all IV medications to all 6 patients forgot to administer unit dose medications for one patient because the record opened by default on the IV tab, and she gave those IV medications, and then went on to the next patient without viewing the unit dose tab.
 - VA Hospital 1: “When major changes like when version 2 was loaded it was decided to bring staff back to the classroom. The Nursing ADPAC and Nursing ADP Support did all the classes. With version 3, after consulting the Nursing Informatics council, which has staff nurses (RN & LPN) on it, it was decided to use posters, handouts, and e-mail to pass on the changes. One every unit there are super users that give meds frequently and assist others with the program. New employees go to a hands on class then pass meds with the orientation instructor.”
 - VA Hospital 2: “Changes are reviewed by BCMA committee and determination of type of training is made...sometimes e-mail notice, sometimes paper to each unit with sign in to say they read, sometimes in the training room. V3 changes were taught to superusers...also paper folder to each unit.”
 - VA Hospital 3: “Training depends if there are major changes (e.g., Version 1 and Version 2). In this case we require mandatory attendance. Training is completed by Nursing ITS (Adpacs) who setup fictitious accounts, patients, create handouts etc. “Super-Users” have never been very helpful or successful.”
 - VA Hospital 4: “Any new features such as BCMA Version 3 requires training in the classroom. We have superusers from each shift, each unit and functions as resource to other staff.”
 - VA Hospital 5: “We have super-users and also try to get the nurse managers into the classroom to show them upgrades. They share this information with staff at the unit level. For major changes we offer training sessions on all tours in the

IRM classroom. We also have a nursing education newsletter and use e-mail to distribute new information.”

- VA Hospital 6: “I taught 18 classes of 4 hours each of BCMA and inpatient pharmacy supervisor came to 30 mins of many of them. Brought copies and bottled water and trained staff in ICU separately from others if I could since they need more remedial training. Yes, super-users have extra menus where they can get started on work order forms and they are supposed to disseminate training that they get 45 minutes a month. Super-users have a menu for IMS work order request. Used to be club for RNs only – 8 people who talked together. Now I say anyone willing to teach or disseminate comes 45 a month and I have an agenda and tell them who to call after-hours and have a video and give training credit. Don’t have to be both a CPRS and BCMA super-user. Changes to patches, web pages, CPRS updates, clinical reminders, how to build templates, etc.”
- VA Hospital 7: “Because we are a very small site, education has been handled by 2 people (nursing and pharmacy ADPAC’s). We did the initial training for all staff, do new employee training, and did formal training for all med passers for Version 2. After review of the changes in V3, we decided to send e-mail, post update bulletins on the units and do ward rounds to educate staff since changes were minimal. I personally do competency verification for each person who passes meds. If problems are identified with a particular staff member (through observation, QM data, med errors, etc), I do refresher training, pass meds with that person, and go through the competency evaluation process with them again. Our superusers are our off-tour supervisors; they handle most of the issues raised by staff during the off-tours, but I occasionally get called for assistance.”
- VA Hospital 8: “The type of training we do for upgrades depends on the extent of change the users will see. For the installation of BCMA v2 every inpatient nurse had 4 hours of computer lab training. We had super-users identified from each inpatient area that received additional training so they could serve as spotters during the training sessions and as unit resource staff during the implementation process. When there are less dramatic upgrades notices are sent out by e-mail describing the changes and self-study packets with screen captures illustrating the changes are sent to each unit for the staff to review. As user problems are identified either additional review classes are scheduled or the user gets 1:1 assistance.”
- VA Hospital 9: “We have no formal train-the-trainer program or superuser program in place. I teach all new users in a classroom setting. The staff on the units work with each new user through their first med pass at a minimum...so they are in essence "trainers". We decide to bring all back to the classroom (or not) based on the complexity of the changes. For example for Version 2 we did mass classroom training around the clock for weeks. For most patches and the recent upgrade to Version 3, phase I, we did emails in Outlook with illustrations, etc. We also do a service level computer news flyer and topic specific postings as needed.”
- VA Hospital 10: “Staff are brought to the training room for major version changes. BCMA Super-Users were trained in 1999 with follow-up communication/meetings for changes. Super-Users are expected to be the first line for staff questions.”
- VA Hospital 11: “I’m constantly providing training material to staff in an effort to help them better understand the basic use of BCMA, as well as providing insight into some of the finer computer functionality nuances, if you will that may make for a more rewarding experience in using a computer program. Yes, we have, for all intents and purposes, super-users, those that demonstrate better than average understanding of the system. It is difficult for me to assess just how often the super-users are utilized as resource persons on a day to day basis however. Incidentally, classroom training is practically impossible at least from a

remedial sense. Staffing is often so tight that training, if needed, is conducted concurrently on the patient care unit.”

- VA Hospital 12: “Usually the committee recommends training or the Nursing ADPAC makes a recommendation to the committee; an alternate route that I have taken is to go to the nursing management group and jointly decide with them – we try to do joint (pharmacy/nursing) updates at least annually and training has been merged with competencies the last 2 years (chance to re-educate). No formal super user programs but it is apparent who the super users are - and they get immediate attention and feedback from me (no matter how busy) - even if it means working with them on my own time.”
- VA Hospital 13: “Yes we use superusers, scope of training depends on scope of change. *E.G.* V 2 – face to face, newsletter, email. V3 phase 1 (minor changes) - email and newsletter (with post test) only.”
- VA Hospital 14: “We used to have super users, but the software changes are so fast and complex that the Clinical Informatics staff provides training in a computer lab which mirrors the work environment. If the software is new or there are significant changes which have an impact on delivery of patient care, we then provide training in the class room setting. We use helpful hints, reference materials, and we have just started a newsletter.”
- VA Hospital 15: “Classroom training was done when a major upgrade occurred. *i.e.*, went from V1 to V2. Super users were trained at that time and expected to be resource for peers afterwards. Then for support, Informatics Nurses rounds with superusers to assist with questions, training issues, etc. Routine random chart audits were done to identify user education issues. This was followed up with documentation of what should be done in the future and sent to the user and superuser with the encouragement to the identified staff to utilize the superuser for questions/concerns and direction. This was also utilized by night tour superusers and the NOD's were given superuser training to support the off tours.”
- VA Hospital 16: “I would recommend that all sites train pharmacists on the nursing side of BCMA. We are just beginning to do this.”

3. Communicate known problems.

Develop a process (e.g., website, help line) for facilitating interested people easily viewing nationally known problems at any time (24 hours a day, 7 days a week).

- **Rationale:** Known national problems often cannot be resolved locally. Knowing national problems reduces time wasted trying to troubleshoot locally. Knowing that problems are not national makes it easier to troubleshoot and resolve local problems. Sharing this information can reduce calls to the national help desk. One source for this information includes the Office of Information website which tracks national patient safety issues <<http://vaww.vhaco.va.gov/vhacio/>>.
- **Supporting data:**
 - VA Hospital 9: “Software problems or barcode problems are reported to me when I am here (Nursing ADPAC), or left for me through email or voicemail if it is something that can wait (from the weekend, etc.). Again, our supervisors can help sometimes. The most common problem is a drug that will not scan. We contact pharmacy and usually it is a barcode problem. Other problems are usually in line with nationally reported issues and we wait for solutions. We recommend actions locally until national solutions are programmed.”
 - VA Hospital 11: “Core group of staff communicate findings and respond to questions. This group includes, Nursing Education Coordinator, (2) Nurses in Nursing informatics, Pharmacy Ad PAC (computer specialist), Inpatient Pharmacy Supervisor, Computer equipment specialist. Nurses are encouraged to contact this core group and staff pharmacist and Nurse Supervisor. Problems are handled in real time by any of these personnel. If unable to resolve, there is a national help desk that is contacted for resolution. Patient safety alerts to all clinical users are sent if system problem is presently uncorrectable.”

4. Display contact information for resources to resolve different types of problems.

- **Rationale:** Time spent locating appropriate resources to aid in troubleshooting reduces the available time to provide patient care. This process can be facilitated, particularly for nurses new to an organization or when systems are first implemented, by making it easier to identify appropriate resources to contact (e.g., IRM support for hardware problems, clerks for problems scanning wristbands, pharmacy for problems scanning medication barcodes, specialized personnel for software problems, engineering or IRM for problems with the wireless network).
- **Supporting data:**
 - VA Hospital 1: “When there is a problem they call the Nursing ADPAC, Nursing ADP Support or the computer help desk. Depending on what the problem determines who fixes it - if the problem is with an order the provider must fix it, if there is a problem with the way pharmacy finished it or verified it then they must fix it. If there is question of why it does what it does, then the Nursing ADPAC and Nursing ADP Support handle it. If it is a programming problem then our programmer looks at it. If it is a problem with the wireless system then engineering deal with it.”
 - VA Hospital 7: “For scanning problems, nurses have been asked to either call a “hot line” number in pharmacy or send an email to g.SCAN via vista; information to be included is the nurse, the patient and the medication. The group who responds to the scanning issues are inpatient pharmacists and the Pharmacy and Nursing ADPAC's. For other BCMA issues, the staff has a “cheat sheet” on each cart with names and numbers for specific issues (IE: IRM support for hardware, pharmacy for scanning and nursing ADP for software, or other undefined problems.)
 - VA Hospital 12: “The VISN made mouse pads with trouble shooting hints on it (compilation from all VISN facilities). We laminate sheets to help Nursing ADPAC and super users IRM.”
 - VA Hospital 16: “Who is contacted is dependent upon what the problem is. Many times the nurse calls pharmacy to correct the order entry problem, or to seek assistance with drugs that will not scan. Nurses also call the BCMA Nursing Coordinator and the other nursing instructor if a problem cannot be resolved. IRM Clinical Applications Coordinators are now monitoring the CABG patient orders on a daily basis to make sure they are input correctly.”
 - Non-VA Hospital: “During the “go live” week, people with the responsibility to help troubleshoot wore red shirts so that users could easily identify them.”
 - Martinsburg VA hospital: “We believe that we have a best practice for this issue. We staff a help desk for everything electronic: CPRS, progress notes, clinical reminders, BCMA. Three nurses, a dietician, a social worker, and a rad tech rotate staffing the desk continuously from 6:30 – 5:30 Monday to Friday. We have IRM on-call off hours. Rather than a system of “page me if you need help” and then wait for them to get back to you, you dial help and someone immediately answers the other end of the line. We can resolve the problem in 5 rather than 45 minutes this way. If not, we can escalate the problem. Nursing supervisors perform this function off-tours. We think of IRM as the hardware people. Clinical informatics is the software people. People who answer help desk also do the teaching for the software, so know the ins and outs.”

5. Do not employ a “double documentation” system.

- **Rationale:** A double documentation system reduces nursing productivity. Different nurses will use different systems as the primary system, leading to the possibility of missed medications, double dose medications, and confusing gaps in documentation.
- **Exception:**
 - During implementation, during the first weeks, electronic medication administration record systems should be implemented in phases in parallel with existing paper-based systems so that discrepancies can be detected and so that it is easier to take the new system offline to make adjustments. This is particularly important for high-risk areas, such as Intensive Care Units (ICUs), that should be implemented after lower-risk areas.
 - Worksheets printed for best practice recommendation #12.
- **Supporting data:** During observations at one facility with a “double documentation” system, documentation was done only on the paper MAR for the following reasons:
 - Forgetting to scan during medication pass
 - Scanning medication did not work after multiple attempts and it was judged to take too long to manually enter information
 - Medication was automatically dropped from the active order list because it was several hours after the administered time because a patient had left the ward, a patient did not have an IV site ready, and a patient had gone to dialysis
 - BCMA system was shut down for scheduled and unscheduled maintenance
 - Agency and “float” nurse administered medications who was not trained on BCMA
 - Covering RN nurse administered medication that LPN was not authorized to administer but did not document it in BCMA
 - Medications were “batch documented” on MAR and so a medication that was documented as administered that was missed
 - Patient record was not available in BCMA
 - Medications were ordered that were not available in BCMA during medication pass
 - Nurse could not access patient record that was in use by another nurse, doctor, or pharmacist
 - Nurse had selected the inaccurate IV medication administration time
 - Administration time was changed on MAR but not BCMA
 - Nurse could not access BCMA due to login problem

During the same observations, documentation was done only in BCMA for the following reasons:

- Forgetting to document in MAR
- Nursing assistant who was responsible for administering topical cream did not administer medication
- Medication was scanned before it was realized patient was not available to take medications or that patient would refuse medications and the medications were never administered
- Medication was scanned before vital sign information was available and so the medication was held
- Medication was scanned and then the patient refused the medication
- Medications were scanned for later administration and then not administered

6. Schedule planned downtimes to minimize disruptions.

- **Rationale:** Planned downtimes are less disruptive than unplanned downtimes. Unexpected downtimes may result in missed doses or double doses due to confusing gaps in documentation. The specific plan for downtime should take into account facility-specific factors such as availability of troubleshooting support in case something goes wrong and when the largest medication passes occur.
- **Exception:** Periodic testing of contingency plans and downtime systems will need to occasionally be conducted during high-usage times in order to ensure that backup plans will function well at unexpected downtimes.
- **Supporting data:**
 - VA Hospital 1: "OIM must coordinate all computer downtimes with the Chief Nurse or designee. We have a back up computer system that users are switched too when the main system has to be down. Planned switch overtime is usually between 7 and 8 pm on Friday and Sunday nights. Usually the switch over takes 30 minutes. This occurs at least once a month. Works well."
 - VA Hospital 2: "Planned downtime is normally on a Saturday evening. MARs are printed in advance of the downtime....pushed out by IRM."
 - VA Hospital 3: "Our downtimes are scheduled on Tuesday, 3-6 am."
 - VA Hospital 4: "Planned downtimes are once a month on a Saturday from 1:00am - 4:00am. It works well."
 - VA Hospital 5: "Downtime happens on the weekend at 2am for routine downtime. This works well with nursing because it is not during a regular med pass schedule time."
 - VA Hospital 6: "not really needed – one patch can take 12 minutes if everyone is off the system"
 - VA Hospital 7: "Downtime (planned or otherwise) is a very rare occurrence at our site (and we are grateful for this fact!!). Planned downtimes are coordinated with IRM and nursing to minimize the effects on patient care. We wait until clinics are closed, and after the major med passes. Most often select the hours between 1-5:30am. For planned downtimes the MAH's are printed in advance, and then filed in chart after use. We have had very few problems with BCMA down time activities. For unplanned downtimes, staff had a great deal of difficulty printing the MAH's from the back-up hard drive since it so rarely happened. To facilitate this process, we have developed flow sheets to guide the staff though the process."
 - VA Hospital 8: "As far as possible, downtimes are planned to avoid high usage periods. Brief downtimes are frequently scheduled for 9:30 AM. Longer times may be in the early evening between the major med passes. We try to schedule installation of patches early in the week so we can identify problems when there is maximum support staff availability."
 - VA Hospital 9: "Our system usually goes down for maintenance one Saturday per month. Usually for six to eight hours. We go to paper MARs during this time and again, do not back enter meds."
 - VA Hospital 10: "Time is planned during low volume med administration time for short periods of time and weekend if extended time is needed. No problems."
 - VA Hospital 11: "Planned downtimes are frequently mid to late evening and most times are M-F. Planned downtimes vary as to how frequent they occur. I'd estimate perhaps 6-8/year. On the whole, planned down times have worked well."
 - VA Hospital 12: "Short times (15 minutes) - then 0600 on Wed. Med times (15 minutes - 2 hours) then 1800 on Wednesdays. Long times (over 2 hours) – weekends; works well as all shifts realize that each one takes a turn without the computer - of course none wants it to happen on their tour of duty."

- VA Hospital 13: "Each Saturday 7:30-8:30 pm. Works ok though of course nursing would prefer NO DOWNTIME."
- VA Hospital 14: "Planned downtimes are scheduled late in evening, very early morning or weekend. No time is a good time to bring your system down, but this works the best for us."
- VA Hospital 15: "Occurs one Sunday a month from 6p-10p. This allows the day tour (12h tours) to get their 6pm meds in before system goes down. Very few meds are scheduled from 7p-9p. System normally back up before 10p which is the next med pass."
- VA Hospital 16: "Planned downtime is not always convenient to all sites as we have different medication times at different hospitals."

7. Swap malfunctioning equipment with a backup unit during servicing.

Each hospital should have a minimum of two complete backup units (laptop, mouse or stylus, battery, scanner, cables, power pack) available in a location that is accessible at any time (24 hours a day, 7 days a week) so that broken, unreliable, or dirty equipment can be serviced without reducing productivity.

- **Rationale:** Productivity is reduced if users must wait for equipment to be serviced “on the fly.” Equipment taken out of circulation can undergo “spot checks” of the entire setup with reduced time pressure to put the equipment back in circulation, including verifying that equipment is reliably functional and that all software upgrades (“patches”) have been properly installed. Ideally, equipment would also be cleaned while out of circulation by BIOMED, which would reduce the opportunities for nosocomial infections. Note that some facilities might need substantially more than two backup units, depending on their size and structure.
- **Supporting data:**
 - VA Hospital 6: “Since there are no backups, we can’t take any to biomed to clean it, so unless it’s being fixed it’s never cleaned.”
 - VA Hospital 9: “We [nursing ADPAC] keep extra supplies, mice, laptops, batteries, scanners, cables, power packs, etc., etc., etc., in our office and as each nurse has a problem we go to the ward and fix or replace. We save the user time by just taking a new setup and bringing the old one back to our office where either we identify and fix the problem, or we enter a NOIS to IRM Service to fix...Our Nursing Supervisors have access to our backup equipment and help the staff on evenings, nights, weekends, and holidays.”
 - VA Hospital 10: “Upon patch install the technical support person inspects every laptop and scanner.”

8. Develop a procedure for cleaning equipment.

A procedure should be developed, ideally in collaboration with experts in infection control such as the Association of Professionals in Infection Control or the Society of Hospital Epidemiology in America, to routinely clean BCMA-related equipment.

- **Rationale:** The Centers for Disease Control and Prevention (CDC) estimates that there are approximately 90,000 nosocomial infection-related deaths in the United States each year (<http://www.cdc.gov/ncidod/eid/vol4no3/weinstein.htm>). Maintenance of equipment cleanliness will be highly variable and difficult to monitor without explicit standards of practice and clear communication and monitoring of expectations. Risks of nosocomial infections can be reduced by improving cleanliness. The JHACO 2005 Proposed Standards for Infection Prevention and Control in hospitals (http://www.jcaho.org/accredited+organizations/hospitals/standards/field+reviews/ic_fr_hap_std.pdf) include “2.g. processes for equipment management, including: appropriate cleaning, disinfection, and/or sterilization of supplies and equipment...”.
- **Supporting data:**
 - VA Hospital 2: “Clean: what's that??”
 - VA Hospital 3: “There was no maintenance until nursing finally convinced ITS that PM was required (JCAHO actually asked for the PM Record last visit.) ITS is supposed to swap Tremont workstations for PM on a regular schedule.”
 - VA Hospital 4: “Can't ensure all BCMA related parts are functional & clean. It is sometimes reported to the ADPACs or IRM. It is hit or miss. IRM is responsible for replacing/repairing parts. done as requested.”
 - VA Hospital 5: “IRM makes rounds twice a week and checks all equipment. Work orders are entered by staff for repairs.”
 - VA Hospital 6: “Since there are no backups, we can't take any to biomed to clean it, so unless it's being fixed it's never cleaned.”
 - VA Hospital 7: “Equipment maintenance is a shared responsibility of nursing, IRMS and Biomed.”
 - VA Hospital 10: “Cleaning is done by the staff using the equipment.”
 - VA Hospital 11: “Ideally, equipment maintenance is everyone's responsibility. Unfortunately, there are some who don't necessarily recognize the importance of maintaining clean and efficient computer equipment. In actual practice, the equipment and devices required to utilize BCMA are troubleshooted as issues arise. Equipment is replaced or swapped out on an as needed basis. A good piece to add to initial computer and software training for new employees is instilling an appropriate degree of respect for the equipment. I find it most disturbing when I discover equipment that has been abused or neglected. This is obviously and potentially very costly, and often has an impact on nursing efficiency related to medication administration.”
 - VA Hospital 12: “No good system - on an "as needed" basis and lately biomed has been involved in the committee which discusses replacement.”
 - VA Hospital 13: “Each staff member has responsibility for basic troubleshooting and keeping equipment clean. Informatics staff does rounds.”
 - VA Hospital 14: “It is the nurses' responsibility for maintaining a clean work area including computer surfaces. However, if there is any spill, etc. that is too large or invasive then Information Management is called for assistance/replacement.”
 - VA Hospital 15: “Equipment is repaired/replaced once a staff member using it identifies there is a problem. There is NO formal cleaning process in place that delineates who is responsible for routine cleaning of computer screens, mouse's, keyboards. This is an issue no one wants to own.”
 - VA Hospital 16: “No one is assigned specifically to clean the equipment. It belongs to IRM and they provide maintenance.”

9. Scan barcoded wristbands and medications prior to medication administration.

Nurses should scan barcoded wristband on patient to verify patient identity prior to medication administration. Nurses should scan barcoded medication immediately prior to medication administration to verify that it is the same name, dose, route, and time as the ordered medication. If not, the nurse should identify the discrepancy and apply professional judgment as to how to proceed. If the nurse cannot identify the discrepancy personally, other personnel (e.g., nurse manager, pharmacy) should be recruited to help troubleshoot before medication administration when the delay to administration will not adversely affect the patient.

- **Rationale:** Barcode scanning is the oldest machine-readable identification system and has been widely used in industrial manufacturing, shipping, and inventory control.^{1 2} Compared to typing, which produces about 1 error every 300 keystrokes, barcode scanning error rates range from 1 character in 15,000 to 1 in 36 trillion.³ Use of bar coding in trauma recording and in medication distribution by a pharmacy group found fewer errors.^{4 5} Consideration of the use of bar code medication administration systems to improve patient safety have been recommended by the Institute of Medicine, the American Society of Health-System Pharmacists, The Advisory Board Company, the National Patient Safety Foundation, the Coalition for the Prevention of Medical Errors, the Massachusetts Coalition for the Prevention of Medical Errors, the National Coordinating Council for Medication Error Reporting Programs Recommendations, and the Pharmacy Society of Wisconsin. However, one study of bar coded patient identification found that routine patient identification scanning was commonly circumvented.⁶ Strong organizational support for scanning of wristbands and medications is likely essential for consistent implementation.
- **Exceptions:**
 - Patients in isolation. In this case, a wireless device (scanner or handheld) can be used that is protected by a clear, thin plastic bag that is thrown away after a single use. Alternatively, there can be a dedicated device in the patient's room if the patient is not in contact isolation, or at least two patient identifiers (neither to be the patient's room number) that meet the 2003 National Patient Safety JHACO requirements can be used, as defined by the local facility (see http://www.jcaho.org/accredited+organizations/patient+safety/npsg/npsg_03.htm for JHACO requirements).
 - Patients who physically cannot wear a wristband, who have a disruptive behavior response to scanning, when there is a tethered scanner on medication cart that does not fit into a patient's room, or when a backup system is in use that does not enable scanning of wristbands. In these cases, at least two patient identifiers (neither to be the patient's room number) that meet the 2003 National Patient Safety JHACO requirements can be used, as defined by the local facility.
 - Incorrect or missing barcode on medication. In this case, pharmacy should be alerted to the problem, in order to better detect if incorrect barcodes have been

¹ Rappoport A. A hospital patient and laboratory machine-readable identification system (MRIS) revisited. *J Med Syst.* 1984;8:133-156

² Weilert M, Tilzer LL. Putting bar codes to work for improved patient care. *Clin Lab Med.* 1991;11:227-238

³ Maffetone MA, Watt SW, Whisler KE. Automated sample handling in a clinical laboratory. *Comput Healthc.* 1988;9:48-50

⁴ Chua R, Cordell W, Ernsting K, Bock H, Nyhuis A. Accuracy of bar codes versus handwriting for recording trauma resuscitation events. *Ann Emerg Med.* 1993;22:1545-1550.

⁵ Kanmaz T, Haupt B, Peterson A. Comparison of manual and bar-code systems for documenting pharmacists' interventions. *Am J Health-Syst Pharm.* 1997;54:1623-1626

⁶ Puckett F. Medication-management component of a point-of-care information system. *Am J Health-Syst Pharm.* 1995;52:1305-1309

applied to multiple medications, improve barcoding of medications, and help to identify cases where the nurse has erroneously assumed that the barcode is incorrect.

- Pharmacy unavailable to resolve discrepancies (e.g., no pharmacy personnel on “off-tours”). In this case, problems should be communicated to pharmacy personnel when available and an alternative plan designed by the facility should be used.
- **Not exceptions:**
 - Patients with missing or inaccurate wristbands. Wristbands should be immediately replaced when detected.
 - Surrogate wristbands not located on the patient (in medication drawer, on door to patient’s room, on table, on ring with bands for all nurses’ patients, stapled in chart). The use of these wristbands have been identified as contributors to “wrong patient” incidents, particularly when groups of surrogate wristbands are kept in a single location, making it easy to scan the wrong wristband.
 - Patient not available during time of scanning for other patients. In these cases, nurses can place the medications planned to be administered in a cup in the patient’s drawer, but the medication packets should not be opened so that the medications remain labeled, the cup should be in the patient’s drawer so that it cannot be easily confused with cups for other patients, and the medications should not be scanned until they are actually being administered so that the administration data is accurate and it is easier to detect if medications have not been administered with the use of the missed meds report.
 - Computer with scanning equipment unavailable. Inadequate access to equipment with scanners contributes to nurses typing in social security numbers and IEN codes during medication passes, additional equipment needs to be supplied or other organizational strategies, such as staggered medication passes, implemented.
 - Use of paper MAR as primary system during medication administration with BCMA “double” documentation occurring at a later or earlier time. There should only be one primary documentation, which should be BCMA in all VA hospitals, location and all nurses should be compelled to use the same one, regardless of individual preferences, to reduce the potential for double-dose and missed dose errors.
- **Supporting Data for isolation patients:**
 - VA Hospital 1: “Nurses type in 9 digit ssn. We are trying to get wireless scanners.”
 - VA Hospital 2: “Cordless or in a plastic bag.”
 - VA Hospital 3: “By policy, patients in isolation may have their ssn manually entered to open the BCMA VDL if there is risk of contamination of the equipment.”
 - VA Hospital 6: “We have tethered scanners and no PDAs so can’t do anything really right now except bypass the system – WANT to do cordless scanners with a baggie that is thrown out or handheld in pocket”
 - VA Hospital 7: “Clear, thin plastic bag is placed over scanner for isolation patients; our scanners are wireless so pt. access isn’t an issue.”
 - VA Hospital 8: “The scanners can be placed in clear plastic bags for scanning in isolation rooms...We use only wireless scanners.”
 - VA Hospital 9: “We created policy with exemptions for scanning wristbands on patients that are in isolation, physically cannot have a wristband, or with a disruptive behavior response to having a wristband scanned, etc. We simply ask that each nurse use the best possible method for identifying the patients without wristbands and to use at least 2 identifiers. We originally used tethered scanners and yes we had a problem with them reaching far into rooms...so we went to wireless scanners and the staff are much happier.”

- VA Hospital 10: "Enter 9 digit SSN."
- VA Hospital 11: "Most of our nursing staff do not scan patient's wristbands in spite of encouragement to do so. Our scanners are wireless. In the case of an isolation patient, I'd recommend obtaining a secondary wristband which could be placed in the patient's medication drawer. In practice, no patient should be without a wristband or some sort of identification. In my experience, when I've come across patients without identification (wristbands) I obtain one from the admitting department."
- VA Hospital 12: "We use wireless scanners (with battery power) and scan without touching the wristband or patient."
- VA Hospital 13: "We do not use tethered scanners on med carts (wireless only). We do not require scanning for isolation patients. We considered using "bag" or "wristband on door" but due to privacy issues and concern about staff not following "isolation" precautions for scanner we decided against scanner being brought in room of isolation patient."
- VA Hospital 14: "We use wireless scanners so there are no space issues. If a patient is in isolation, the scanner can be placed into a clear plastic bag to scan the patient's armband."
- VA Hospital 15: "Resolved by going to wireless scanners."
- VA Hospital 16: "We just received non-tethered scanners which can be placed in a plastic bag and taken into the isolation patient's room. The non-tethered scanners have eliminated the problem with med. carts not fitting into a patient room."

10. Caregivers should personally document at the time of medication administration.

Caregivers (e.g., RNs, LPNs, respiratory therapists, nursing assistants who administer ointments in long-term care facilities) who administer medications, medicated ointments, or respiratory treatments should personally document administration at the time of administration.

- **Rationale:** Relying upon communication between RNs, LPNs, respiratory therapists, nursing assistants, or others in order to know when and if a medication was administered is much less reliable than having the person who administered it document it at the time of administration due to memory limitations and erroneous interpretations introduced during communications between multiple people. Stated simply, if the person is authorized to administer it, then they should be supported in personally documenting it. An alternative to supporting documentation in BCMA by nursing assistants is to require that only licensed nurses (RNs, LPNs) administer medications and ointments that are documented in BCMA.

- **Supporting data regarding administration of ointments by nurse's aides:**
 - VA Hospital 2: "RN/LPN must document...they must also verify that if it is done with bath or whatever by another individual, that is was really accomplished."
 - VA Hospital 4: "The same nurse who gives meds administers treatments of creams & ointments. Non-medicated creams are administered by nursing assistants or self administered by the patients. This is documented by the nurse with a comment if administered by NA or patient."
 - VA Hospital 5: "In the nursing home there is sometimes a treatment nurse...but not often."
 - VA Hospital 6: "Handwritten treatment sheets, one of the goals is to figure this out nationally with nursing workgroup."
 - VA Hospital 7: "Creams and ointments are administered by NA's; charted on paper treatment form at this time; we would like to have NA's chart the administration in BCMA, but availability of equipment is an issue."
 - VA Hospital 10: "Nurse Assistants administer creams and ointments. The NA uses BCMA."
 - VA Hospital 12: "RN documents all treatments in BCMA as they supervise LPNs and NAs - separate treatment book for NAs to see and chart treatments on paper."
 - VA Hospital 13: "NA's administer although licensed staff verify and document in BCMA (NA's document on tx sheet)."
 - VA Hospital 14: "The nursing assistants administer creams, etc and they scan the patients armband and record in BCMA in real time. We have set up treatment carts with wireless laptops and wireless scanners."
 - VA Hospital 16: "We have NAs who administer some creams. In this case the nurse passing medications enters the medication as given in BCMA and adds a comment that it was administered by the NA."

11. Verify allergy information displayed in BCMA prior to administration.

- **Rationale:** The prominent display of allergy information on the BCMA interface, although important, is not sufficient to deter nurses from administering medications that are ordered to which a patient is known to be allergic. In addition, allergy information displayed in BCMA is not always accurate due to a variety of reasons (e.g., difficult to remove an inaccurate allergy indication, missing data). It is likely that machine detection of possible allergies, likely to be added in future software versions, will have high false alarm rates, and so will also be insufficient as the sole barrier. Additional strategies (e.g., allergy bracelet, asking patients to recite allergies prior to medication administration) should be employed to identify allergies.

- **Supporting data about how allergies are identified by nursing personnel:**
 - Every study participant during usability tests (15 nursing personnel) of all versions of BCMA, including a handheld version designed by a different vendor, administered a medication to which a (simulated) patient was allergic in a laboratory setting where they were frequently interrupted. In debrief interviews, all reported that they were unaware of the displayed information.
 - VA Hospital 1: "Providers enter allergies as an order. These are viewable thru BCMA. Other health care professional can also enter allergies, like food."
 - VA Hospital 2: "By the allergy warnings!"
 - VA Hospital 3: "I think these are well documented in CPRS and BCMA headers."
 - VA Hospital 4: "Thru the ID band, BCMA alert & CPRS."
 - VA Hospital 5: "BCMA displays allergies. Allergies are also printed on the wristband."
 - VA Hospital 6: "on VDL"
 - VA Hospital 7: "In red on the BCMA screen; in CWAD in CPRS."
 - VA Hospital 8: "BCMA has the allergy information displayed at all times."
 - VA Hospital 9: "Allergies are assessed on admission/transfer, and quite visible throughout BCMA and CPRS. Each caregiver is responsible for identifying allergies as they render care and give medications."
 - VA Hospital 10: "This displays in BCMA and on the Due List."
 - VA Hospital 11: "Patient's allergies are listed in several areas including BCMA, CPRS, and sometimes on the patient's ID wristband or on a separate allergy ID band. Too, as should be the practice, patients are often asked to recite any allergies prior to any medication administration."
 - VA Hospital 12: "Available in BCMA and computer entry in CPRS/VISTA - audits done to make sure all have entries"
 - VA Hospital 13: "Comes on BCMA screen when opening patient record. On admission RN is responsible for verifying allergies and ensuring that all reported allergies are documented in clinical record (and therefore viewable in CPRS, Pharmacy and BCMA)."
 - VA Hospital 14: "Allergies are viewable upon entry into an electronic medical record in BCMA and on the coversheet in CPRS."
 - VA Hospital 15: "Allergies show on the BCMA VDL for all to see as soon as it is opened."
 - VA Hospital 16: "With Version II BCMA the allergies are readily visible in BCMA."

12. Support staff personnel should print a report at the beginning of a shift for nurses to use as an “overview” worksheet.

- **Rationale:** Nurses can better plan medication administrations if they can see “at a glance” an overview of the recent medication history and what medications are ordered for administration during their shift. They will also make fewer “errors of omission” if they quickly jot down notes in a temporary location because their notes will remind them to do activities, including pass along information during the handoff to the next shift. Note that this report should serve only as a supplementary tool because the information can be outdated within minutes, and so should not be used for administration or documentation purposes. Also note that it is important for nurses to periodically “refresh” the information displayed in BCMA so that they are administering medications off of the most current information. Finally, note that this worksheet contains the social security number for the patients, and so using the worksheet might implicitly encourage the use of “workarounds” of typing rather than scanning patient wristbands.
- **Long-term:** One to two-page overview reports tailored to the acute care, ICU, and nursing home setting should be designed for use by nurses as a planning worksheet by BCMA developers. Individual user-tailorable options for which reports to print when might be created for automated printouts.
- **Supporting data:**
 - VA Hospital 1: “Very few people print a paper due list. Many will print the admin time list, which lists all the patients and the number of meds they have due each hour.”
 - VA Hospital 3: “Policy required an MAH be printed at the start of every shift and given to the nurse who will be caring for the patient. The MAH is used for review of previous administration history (holds, refused, etc), planning and as a worksheet for notes during the shift. The MAH is ONLY a worksheet, med administration is only done using BCMA GUI VDL.”
 - VA Hospital 4: “Nurses print their due list or medication profile at the beginning of each shift. They mark which narcotics may be needed for the med pass. During med pass, the nurse does a refresh of the VDL to see if new orders had been processed that did not appear on the due list.”
 - VA Hospital 5: “Staff will often print the due list prior to the shift to review medications.”
 - VA Hospital 6: “Acute care look at each patient’s meds before med pass; others print MAR; highly variable depending on the place; they have a PYXIS for narcotics and [other substances they want to control]. Highly variable for printing, some print for themselves, some print for the whole team and distribute.”
 - VA Hospital 7: “Staff run the Ward Administration Times report for unit to use as tool to know when meds are due; when new orders are verified, they note on this shift if it is a med at an additional time than those already identified on the administration time report. All units (except ICU) use this method. In ICU staff run a Ward Administration Times report for each individual pt to use as a worksheet.”
 - VA Hospital 8: “Nurses use either the Missed Medication report or the Ward Administration Report to preview what medications are scheduled for the patient. Some also print a copy of the Due List for just PRN’s to have a quick reference for what PRN medications a patient has ordered.”
 - VA Hospital 9: “We require that each nurse administering meds run a DUE List for their tour of duty, and even rerun the list after morning physician rounds, etc. They know in advance what meds are due (especially irregulars such as q18 hrs IV antibiotics), what information they need in advance like blood sugars, vital signs, etc. This gives them a visual resource for planning the med pass, and also a momentary reference in case of technical problems.”
 - VA Hospital 10: “We print the Due List at the start of each tour for staff review. Staff review the Due List, but all use BCMA to give meds/treatments.”

- VA Hospital 11: “Nursing staff invariably utilize a preview sheet of patients' medications. This datasheet can and does provide a general overview of the patient's medications and scheduled administration, however, it does not include continuous infusion medication, PRN medication, one-time or on-call medications--again, the shortcomings of BCMA reports. Incidentally, many of the nursing staff use the medication preview sheet as a kind of report sheet to jot down bits of information to pass along to follow-up tours.”
- VA Hospital 12: “The units use several of the print functions from BCMA - they print MISSED MEDICATIONS in advance - and smaller units print the DUE LIST (ICU, Med-Surg).”
- VA Hospital 13: “They can see narcotics and other medications on paper DUE LIST although not all nurses utilize this functionality.”
- VA Hospital 14: “They are number of access points to look at patient's medication profile within BCMA and within CPRS. We also continue to print Medication Administration Records(MAR) which is the paper list of current meds. The MAR is maintained as an up-to-date list since we have not completed our electronic BCMA Contingency Plan.”
- VA Hospital 15: “Routinely Nurses print at the start of their shift the "Due List" which lists all current meds both prn and scheduled. This is very popular with all units. They are continually reminded that this is for planning purposes only as the due list is only current at the time printed.”
- VA Hospital 16: “Some areas print VDL at the beginning of each shift for their patients.”
- Commercial vendor representative: “We have that wonderful worksheet for the nurses and since it is printed just prior to the start of each shift and if all orders are confirmed it is an extremely up to date document. It even has the last time a PRN med was given. The RNs typically love the worksheet.”

13. Nurses should print missed medication reports once a shift.

Organizations should develop a process for tracking that reports are reviewed by nursing personnel that does not involve extensive documentation or time commitments by nursing personnel or add to the duties of the charge nurse without reducing patient load. In addition, nurse managers should not rely upon missed medication reports to file medication error reports. When nurses are particularly concerned about the possibility of missing medications for a particular patient, they should view the “Med Admin Hist” online immediately after administering the medications.

- **Rationale:** Missed medications, particularly one-time order and on call medications that are removed one hour after the ordered time due to provider or pharmacist mis-entry and one-time orders that are needed to remain active for more than 12 hours, can be reduced by nurses reviewing the medications that were ordered but not yet administered. Without a process for tracking (e.g., nursing personnel place printed reports in the nursing manager’s mailbox, which are reviewed and thrown away once a week), the use of the missed med reports will be highly variable and difficult to monitor. In order to avoid reducing available nursing time to provide patient care, the tracking process should avoid extensive time or documentation commitments for nurses and charge nurses. In addition, in order to continually improve the safety culture, the reports must not be used for punitive purposes.
- **Supporting data:**
 - VA Hospital 1: “Missed med reports are view after every med pass and before leaving at the end of the shift. Each med nurse, if there is a problem then the nurse manager addresses it.”
 - VA Hospital 2: “The missed med report is automatically printed to each ward prior to the end of each shift. We also suggest to staff that they should run it on each individual patient prior to leaving the bedside after administering that patient’s meds.”
 - VA Hospital 3: “In our policy, as part of the scheduled administration process, the nurse must run the GUI Missed Med Report and review for missed meds every time they give scheduled meds (online view). We also require by policy that the missed med report be printed by the charge nurse 1 hour before the end of every shift and reviewed. Any missed meds must be resolved before the end of the shift. The PRN effectiveness report is also printed for review.”
 - VA Hospital 4: “Missed medication report is run every day each shift by each nurse administering medication that day. The report is corrected and given to the nurse manager and sent to the Nursing ADPAC.”
 - VA Hospital 5: “The missed med report is printed at the end of each med pass by the RN. The following day the nurse manager prints the report for the previous 24 hours to make certain all meds were given. He/she submits this to Nursing Education (working with OPMI) to track.”
 - VA Hospital 6: “Encourages missed meds report every pass but accepts maybe only done at the end of the shift sometimes. Gently tells people that they will spotcheck on printing the missed meds report to see how they are doing”
 - VA Hospital 7: “Missed Med report run at the end of each of each med pass by the person passing meds. They administer, or mark held, refused, etc for meds on the list; notate on the list actions taken, and attach the unit assignment sheet for nurse manager review.”
 - VA Hospital 8: “Our policy is that the missed medication report will be run at the beginning, middle, and end of each shift. On the Med-Surg units the charge nurse runs the report for the entire unit. The process is still evolving for the Intensive Care Units and the Mental Health Unit.”
 - VA Hospital 9: “We require that a missed med report be run by each unit after each major med pass...and subsequent reconciliation of that report. The staff are pretty compliant with this and call if a medication shows on the report but

- they have administered the med. I look into the situation and usually it is the case of a renewal, etc. The staff on the floors run the reports.”
- VA Hospital 10: “Verify meds were not missed after each patient and at the end of each main med pass. Tracked after each main med pass by any of the staff on each unit. Missed meds are referred to the Nurse Manager.”
 - VA Hospital 11: “Quality checks are conducted or, at least, should be conducted by the individual user on a concurrent basis, but some staff (charge nurse, usually) are blessed with the responsibility of generating reports at the end of a tour to identify any discrepancies. A major consequence of relying on the reports is, they can be wholly inaccurate. When the BCMA program was conceived, the developers fell far short with respect to having quality reports available.”
 - VA Hospital 12: “Printing a Missed med report after each major med pass - person who gave the meds is responsible Nursing Supervisor runs a 24 hours list from the prior day and writes up 10-2633's as necessary”
 - VA Hospital 13: “Missed medication report is printed "after each med pass" which means - usually at 8 am, 12 noon, 3 pm, 7 pm, 11 pm.... twice a shift except for nights only once. Some floors which have had med errors related to not checking missed med reports turn in their missed med reports at end of tour to Nurse Manager.”
 - VA Hospital 14: “A missed med report is pulled after each administration pass. The nurse administering meds reviews and is responsible for responding to any discrepancies. This may mean administering a med to a patient who was not available earlier, it may mean a call to the Help Desk or Pharmacy.”
 - VA Hospital 15: “Procedure/policy is for a 24h chart check to compare the VDL with the orders in CPRS/GUI. Procedure/policy is no medication is to be administered prior to verification of order by nursing after pharmacy first verifies. Exceptions: code situations. Missed medications list is to be done a minimum of once prior to leaving shift. Recommended that nurses view this routinely whenever they open the VDL on a patient.”
 - VA Hospital 16: “A missed medication report is generated after each major medication pass by the nurses passing medications. At the change of shift, nurses from on-coming and off-going shifts review the report communicate any need for follow-up.”

14. Alert nurses to new STAT orders

Particularly for STAT orders and orders in the Intensive Care Unit (ICU), it is important for nurses to know when new medication orders have been written. In many hospitals with the paper-based Medication Administration Record (MAR), this is accomplished by having printouts of new orders arrive on labels in a central location. Nurses were alerted to new orders by the sound of a new printout. With BCMA, it is no longer necessary to have labels printed, and seeing an updated view of orders sometimes requires a manual "refresh" command. Methods to alert nurses to new STAT orders, such as by an overview display on a dedicated monitor in a central location with information about new orders, should be developed. In addition, physicians should be required to inform the nurse verbally when a new STAT order has been written.

- **Rationale:** Relying upon nurses to continuously access the electronic medical record to detect new orders is inefficient and prone to encourage delayed or missed medication orders, some of which may be critical to patient safety.
- **Supporting data:**
- VA Hospital 4: "During med pass, the nurse does a refresh of the VDL to see if new orders had been processed that did not appear on the due list."
- VA Hospital 9: "We require that each nurse administering meds run a DUE List for their tour of duty, and even rerun the list after morning physician rounds, etc."
- VA Hospital 15: "Routinely nurses print at the start of their shift the "Due List" which lists all current meds both prn and scheduled. This is very popular with all units. They are continually reminded that this is for planning purposes only as the due list is only current at the time printed."
- VA Hospital 17 and 18: It was observed that software code had been created that output to a dedicated monitor in a central location in the Intensive Care Unit the following information:
 - Mr. Smith has 4 new orders
 - Mr. Dubois has 1 new order
 - Mr. Graham has 3 new orders

15. Replace wristbands as needed and periodically in long-term care.

Replace worn, missing, or inaccurate wristbands as soon as discovered by anyone in long-term care and acute care. In long-term care settings, support staff personnel should replace wristbands periodically (e.g., once a week). Install wristband printers on every ward and allow nurses, nursing assistants, and ward clerks access privileges to print new wristbands. If wristbands are unable to be applied (e.g., patients who physically cannot or refuse to wear a wristband), they may be applied to items unique to the patient (e.g., stapled into patient paper charts) but not to items that are not unique to the patient (e.g., on a bedside table, outside the room, in a patient's medication drawer, on top of a medication cart or computer console).

- **Rationale:** Scanning wristbands to verify patient identity is more likely to occur when wristbands reliably scan on the first attempt. Wristbands become worn between several days and two weeks after application. Acute care patients rarely stay long enough to warrant periodic replacement, but long-term care patients have longer lengths of stay. Note that application of wristbands is a potentially error-prone step, both when first applied and during replacement, and facilities should consider how to increase the reliability of that step similar to the process for placement upon admission, such as by requiring verification of patient identity during application.
- **Supporting data:** Of 16 VA hospitals: 16 replace on as needed basis in acute care, 11 replace on an as needed basis in long-term care, 4 replace once a week in long-term care (3 printed by clerk, one by morning shift); estimates of how often wristbands need to be replaced range from 1-2 times per week to every 2 weeks. All hospitals have installed wristband printers on every ward.