

Barcode Medication Administration (BCMA)
& Quality Improvement (QI) Strategies to Increase Scan Rates

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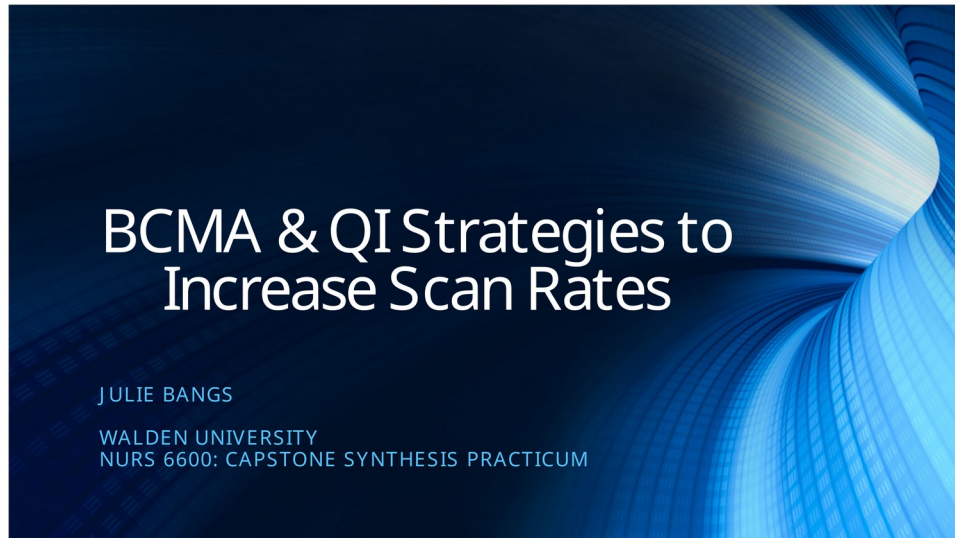
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NURS 6600-3 Capstone Synthesis Practicum

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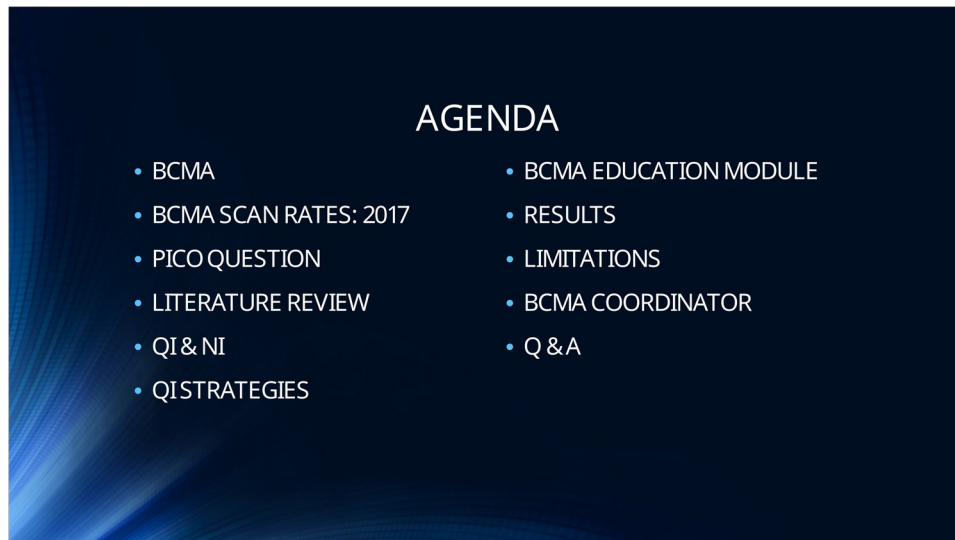
Abstract

The Capstone Synthesis project is grounded in a Barcode Medication Administration (BCMA) quality improvement (QI) initiative to improve patient safety and outcomes. Identifying and understanding which strategies are most effective to decrease workarounds, will help to create an evidenced-based BCMA education module. Creating a BCMA Coordinator position would benefit the facility by having a dedicated resource that provides ongoing support as an educator, troubleshooter, and consultant. Optimizing the BCMA process and workflow is projected to increase the patient and medication barcode scanning rates. The BCMA education module will consist of In-Services, a BCMA manual, and a PowerPoint presentation. To gauge the effectiveness of the project, the 2017 BCMA patient and medication barcode scanning rates will be analyzed and compared to the post-education intervention scan rates.



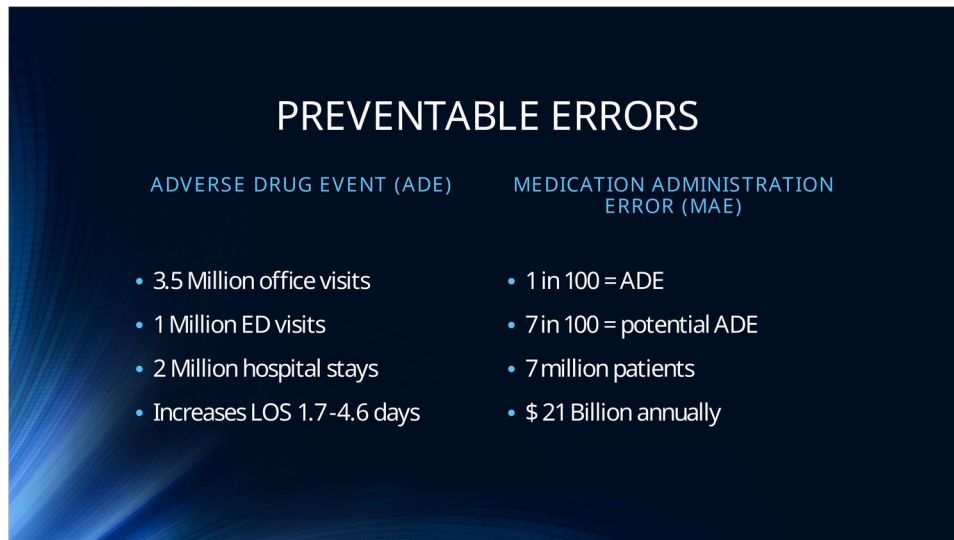
Good Morning/Afternoon Ladies and Gentlemen.

Thank you for taking time out of your busy schedules to join me while I discuss BCMA, our current scan rates, and evidence-based strategies to improve the scan rates.



The Capstone Synthesis project is grounded in a Barcode Medication Administration (BCMA) quality improvement initiative to improve patient safety and outcomes. Identifying and understanding which strategies are most effective to decrease workarounds, will help to create an evidenced-based BCMA education module.

Optimizing the BCMA process and workflow is projected to increase the patient and medication barcode scanning rates. The Emergency Departments consistently have the lowest scanning rates, and they will serve as the target areas.



Adverse drug events (ADEs) are any injury resulting from medication use and include physical and mental harm, or loss of function, and contain the largest category of preventable instances experienced by hospitalized patients. It is estimated that ADEs account for 3.5 million office visits and 1 million emergency department (ED) visits, impact 2 million hospital stays annually that increase lengths of stay (LOS) between 1.7 and 4.6 days (da Silva & Krishnamurthy, 2016).

Medication administration errors (MAEs) refer to any mistakes made during the administration process regardless of the patient outcome. Although most MAEs are benign (Sakowski, Newman, & Dozier, 2008), one in 100 MAEs result in an ADE and 7 in 100 have the potential to (Zhu, Weingart, Auerbach, & Melin, 2017). Preventable medication errors affect over 7 million patients with related costs nearing \$21 billion annually.

Barcode Medication Administration (BCMA)

- Developed 1995: Glenna Sue Kinnick, RN at a Kansas VAMC
- Automates & Standardizes the Medication Administration Process
- Barcode Technology: Six "Rights" of Medication Administration
 - Patient, medication, dose, time, route, documentation
- Reduces MAEs by 50 %
- Reduces ADEs by 25%

There are five phases in the process of a patient receiving medication in a hospital: prescribing, transcription, dispensing, administration, and monitoring (Truitt, Thompson, Blazey-Martin, NiSai, & Salem, 2016).

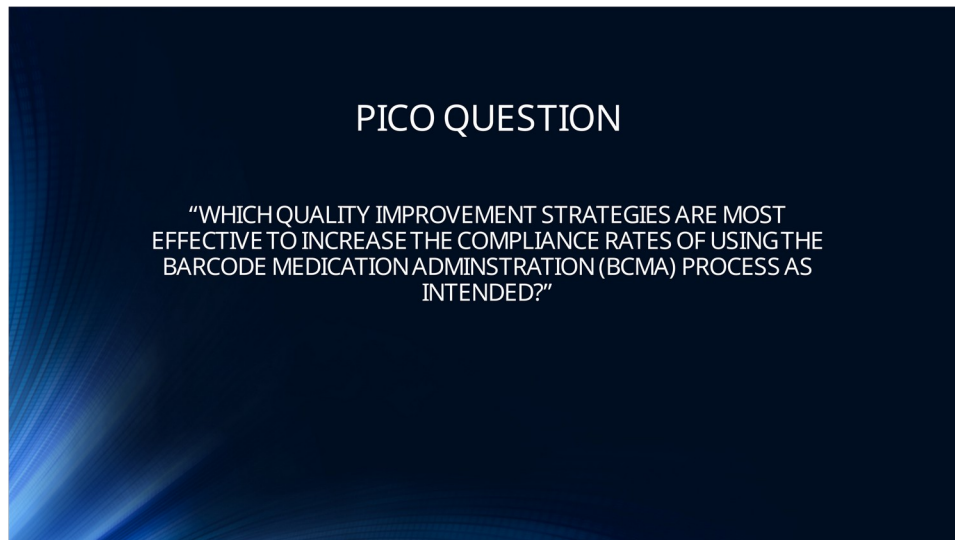
The BCMA technology addresses the administering phase and it was originally developed by a registered nurse (RN), Glenna Sue Kinnick, and first implemented in a Kansas Veterans Affairs Medical Center (VAMC) in 1995 (Weston & Roberts, 2013).

The BCMA is a process using barcode technology to automate and standardize (Bargren & Lu, 2009) the process of nurses administering medication per the six rights: right patient, right medication, right dose, right time, right route, and right documentation. Studies have shown that implementing BCMA has significantly reduced MAEs by 50% and ADEs by 25% (Truitt, Thompson, Blazey-Martin, NiSai, & Salem, 2016);

2017 BCMA SCAN RATES

EMERGENCY DEPARTMENTS	INSTANCES	SCANNED	NOT SCANNED	SCAN RATE
H.ED	34,533	30,655	3,878	88.8 %
HP.ER	37,903	35,958	1,945	94.9 %
HR.ER	16,366	16,017	349	97.9 %
HH.ERFS	13,978	13,618	360	97.4 %
HW.ERFS	8,000	7,732	268	96.7 %
Health System	110,780	103,980	6,800	95.4 %

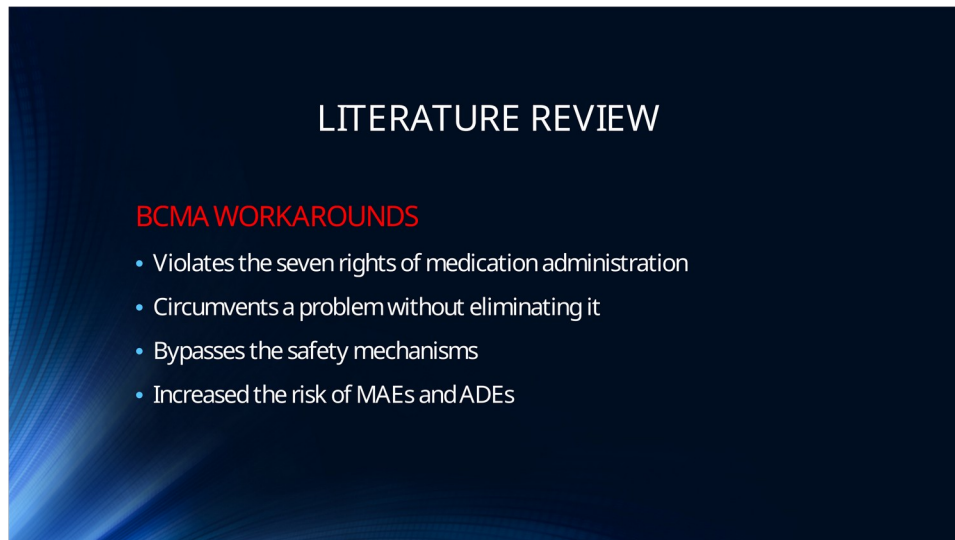
Benchmark = 98 %



The PICO question serves a role in determining the research design, theoretical perspective, and the appropriate tools to analyze the relevant data. The goal of this project is to answer the following PICO question from a NI's perspective:

Which quality improvement strategies are most effective to increase the compliance rates of using the barcode medication administration (BCMA) process as intended?

This project aims to investigate quality improvement strategies and deliver four primary objectives: (1) develop an evidence-based BCMA education module, (2) optimize the BCMA process and workflow, (3) increase BCMA scan rates, and (4) promote patient safety by decreasing MAEs, ADEs.



LITERATURE REVIEW

BCMA WORKAROUNDS

- Violates the seven rights of medication administration
- Circumvents a problem without eliminating it
- Bypasses the safety mechanisms
- Increased the risk of MAEs and ADEs

Despite the major benefits of BCMA, there have been unintended consequences, a false sense of security, and the reliance on technology to catch all errors (Bargren & Lu, 2009). Some nurses have resisted HIT because it changes their workflow by slowing down the medication administration process (Samaranayake, et al., 2014).

Most errors detected by BCMA are directly related to the seven rights* of medication administration, and discontinued, expired, or no medication orders (Sakowski, Newman, & Dozier, 2008). If this is the case, then why do nurses override BCMA alerts and warnings that can lead to MAEs and ADEs?

Healthcare processes that are computerized without careful analysis can lead to workarounds (Walker & Carayon, 2009). Workarounds are the problem-solving behaviors exhibited by nurses to bypass the safety mechanisms associated with BCMA technology. “When there are large gaps between intended practice, as documented in policies and procedures, and actual practice, predictable problems arise (Patterson, Rogers, Chapman, & Render, 2006, p. 21).”

Not only do workaround strategies reduce the effectiveness of BCMA in preventing errors, in some cases, there is also an increased risk of producing a MAE and ADE.

*Seven Rights: right patient, right drug, right dose, right time, right route, right documentation, and right reason.

LITERATURE REVIEW (con't)

BCMA BARRIERS: PEOPLE

- Resistance to change
- Allergy information incorrect or missing
- Wrong ID band on wrong patient
- Surrogate patient/medication barcode scanned
- Verbal order never written
- Order entered on wrong patient
- Distractions
- Duplicate medication orders
- Patient doesn't want to be awakened
- Medication was documented 'given' before administration

The first step when problem-solving is to acknowledge one exists and define it. The problem addressed in this project stemmed from a QI initiative. Barcode scanning levels have been deficient, and the BCMA scan rates need to reflect safe practice and achieve our benchmark of 98%. When BCMA is not used as intended (decreased scan rates through workarounds), then it compromises patient safety.

Issues with HIT can become barriers to the BCMA process, and are usually classified into three areas: people, process, or technology. Several barriers and consequences of not using BCMA as intended were identified through personal experiences, casual conversations with nurses, and literature review.

- Staff resistance to technology and failing to follow policy and procedure (Samaranayake, et al., 2014)
- Allergy information displayed in BCMA was not verified (Patterson, Rogers, & Render, 2004)
- The incorrect ID band was placed on the wrong patient violates BCMA, and the reliance on technology may inhibit asking the patient for two identifiers (Hardmeier, Tsourounis, Moore, Abbott, & Guglielmo, 2014)
- A surrogate patient or medication barcode was scanned (Keane, 2014)
- A verbal order that was never written, scanned, or entered in CPOE by the nurse, provider, and not received by the pharmacy (Bargren & Lu, 2009)
- An order entered on the wrong patient (Bargren & Lu, 2009)
- A wrong medication was prescribed, transcribed, dispensed, administered (personal experience)
- Distractions (Westbrook, et al., 2017)
- Duplicate medication orders are scheduled for different routes (oral and intravenous; personal observation)
- The patient ID band is difficult to access, or the user does not want to awaken the patient requires users to use an ID band not affixed to the patient (Keane, 2014)
- The medication was charted before administration (Hardmeier, Tsourounis, Moore, Abbott, & Guglielmo, 2014)

LITERATURE REVIEW (con't)

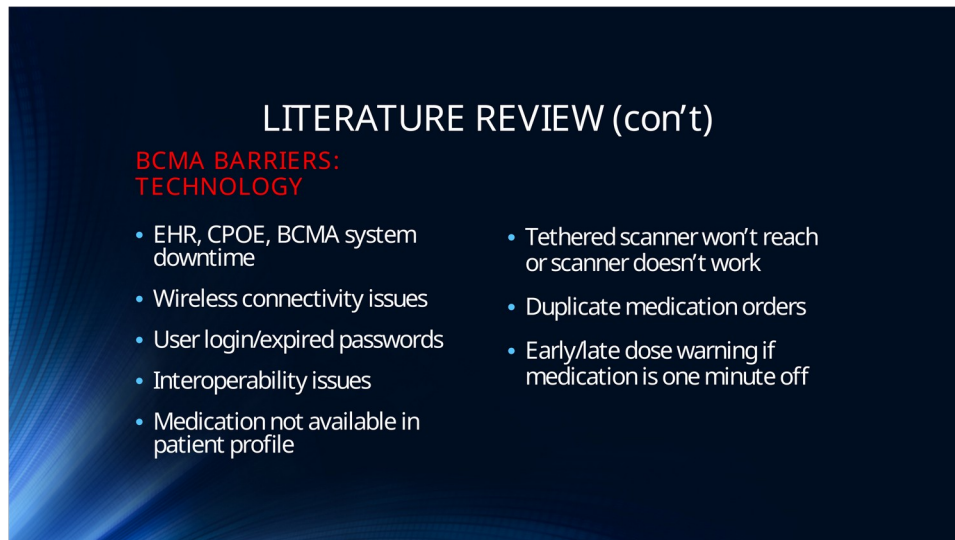
BCMA BARRIERS: PROCESS

- Patient not registered
- Increased steps to use BCMA
- Increased workload/short staffed
- Med not available in Pyxis
- Missing/damaged barcode
- Split dose, incorrect dose keyed
- Wrapper discarded before scanning
- New admission orders prior to patient transfer
- Manually pulling meds from "floor stock"
- Not selecting a reason med was given early/late/not at all

LITERATURE REVIEW (con't)

BCMA BARRIERS: PROCESS

- Meds pulled on override
- Different IV pumps/tubing from OR to floor
- Time needed for pharmacy to verify medications
- Patient brings own medications
- One-time dose order expired prior to administration
- Patient is off the unit
- BCMA not available off the unit
- Lack of or outdated BCMA policy and procedure



LITERATURE REVIEW (con't)

**BCMA BARRIERS:
TECHNOLOGY**

- EHR, CPOE, BCMA system downtime
- Wireless connectivity issues
- User login/expired passwords
- Interoperability issues
- Medication not available in patient profile
- Tethered scanner won't reach or scanner doesn't work
- Duplicate medication orders
- Early/late dose warning if medication is one minute off

- EHR, CPOE, BCMA, and automated dispensing machine system downtime requires the manual entry in: prescribing, transcription, dispensing, administration, and monitoring. The data is unable to flow to other clinical processes (Bargren & Lu, 2009).
- Issues with wireless connectivity (Early, et al., 2011)
- A user login is not functioning (Holden, et al., 2011) requires contact with the IT help desk, increasing the steps in workflow and creates delays in emergency interventions.
- An expired password denies the user access to the EHR, CPOE, BCMA, and automated dispensing machines and requires the user to contact the IT help desk or pharmacy for assistance (casual conversation)
- A medication not available in patient's profile in the automated dispensing machine increases the steps in the workflow and requires the user to contact pharmacy for assistance (personal experience, casual conversation).
- Medication barcode can't be scanned and requires user to manually enter barcode, or contact pharmacy for a new label (Bargren & Lu, 2009).
- A tethered barcode scanner not working requires the user to identify the patient and medication manually, or scan the medication in another (personal experience, casual conversation).
- The electronic due time for a medication incorrectly follows a preexisting dose time and fails to recognize duplicate orders (Bargren & Lu, 2009).
- An early or late dose warning is given if one minute early or late (personal experience, casual conversation) contributes to alert fatigue.

LITERATURE REVIEW (con't)

ETHICAL & LEGAL IMPLICATIONS

- 18,000 nurses
- 150,000 physicians
- Rethink behaviors
- MAEs and ADEs are preventable
- BCMA saves lives
- CASE Example
- Children 3X more susceptible to ADEs

Ethical and legal implications need considering when workarounds occur when (not) using BCMA. Over 18,000 nurses and 150,000 physicians are involved in malpractice cases annually, and nurses must to rethink their behaviors the way a litigation lawyer would (Roman, 2007). The MAEs and ADEs are the most common mistakes that lead to nurses being sued. Most errors are benign; however, when administering medications to children, there can be devastating consequences. Reflect on the following case example:

“Taralynn, Mackay, RN, JD, an attorney with McDonald, Mackay & Weitz LLP in Austin, TX, tells of a client, an experienced and knowledgeable nurse, who was having a hectic day. Mackay said that this nurse pulled an anesthetic from a shelf that held two similar looking vials. Without completing the five rights of medication administration-verifying that she had the right patient, right route, right dose, right time, and right medications-she set out the vial for the physician, who didn’t check it before administering it to the patient, a child who went into cardiac arrest and died. According to Mackay, an autopsy found that the medication error had caused the child’s death. From the evidence, the BON (Board of Nursing) determined that many systems and practice errors had led to the death. It imposed restrictions on the nurse’s license. Although these restrictions weren’t severe, the nurse quit the profession. She told Mackay that she could no longer continue nursing because each day, she carried the knowledge that because she was rushed, she made a mistake that killed someone.

“Every medication error I see can be traced to at least one of the rights not being checked,” said Mackay. Her advice to nurses: Never let anyone distract you when you’re preparing medications. “When you’re about to give a drug that has a high potential for harm, or if the patient is a child, have another nurse double-check the five rights prior to administering it,” she advises (Roman, 2007).”

Importantly to note, that in acute care settings, children are three times more likely to experience an ADE than adults. Weight-based dosing, the lack of alternative drug formulations, and the requirements for small infusion volumes (Hardmeier, Tsourounis, Moore, Abbott, & Guglielmo, 2014) have been identified as the primary MAEs leading to the ADEs.



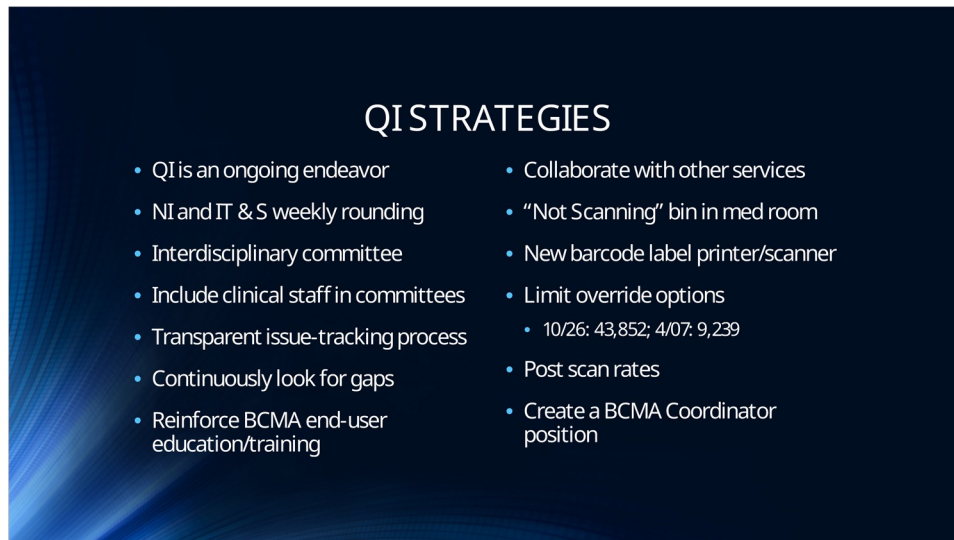
QUALITY IMPROVMENT through NURSING INFORMATICS

- *To Err is Human*
- HIT transforms patient outcomes
- Culture of Safety
- Accountability
- Holistic approach
- People, process, technology paradigm

We Need to Optimize:

- Education
- Training
- Hardware
- Software
- Process
- Workflow

- Most patient and medication safety initiatives became a result of the Institute of Medicine's Report, *To Err is Human* (Klingner & Prasad, 2013).
- Health information technology has transformed systems and processes, changed workflow, and indirectly transformed patient outcomes (Holden, et al., 2011).
- The quality of HIT requires a multidisciplinary approach that includes executive leadership (Juste, 2018), and can be improved using different methods.
- Creating a culture of safety (Early, et al., 2011), accountability (Klingner & Prasad, 2013), and ensuring the organizational policies and procedures are updated with current evidence, are priorities in QI initiatives (Kelly, Harrington, Matos, Turner, & Johnson, 2016).
- Using a holistic approach encourages open communication and helps nurses understand the people, process, and technology paradigm (Abbotoy & Sessanna, 2012).
- We need to optimize the BCMA process by providing additional education and training, installing new hardware, vendor software enhancements, and process and workflow improvements are areas that need focusing on.



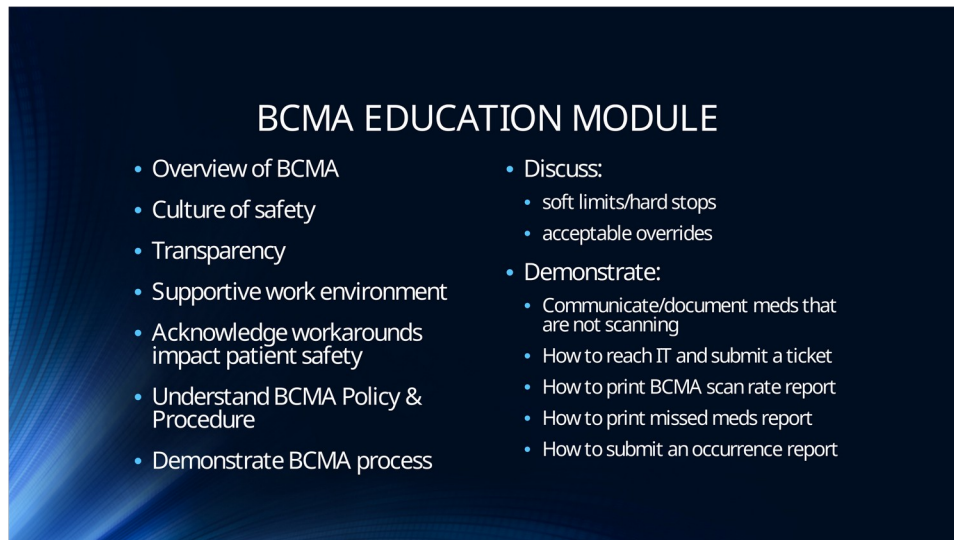
Quality improvement is not a one-time effort, but an ongoing endeavor for sustainability (Harrington, Clyne, Fuchs, Hardison, & Johnson, 2013). The NI and IT team weekly rounding facilitate communication between the people, process, and technology by continuously monitoring and optimizing through feedback of process measures and patient outcomes (Walker & Carayon, 2009). Bargren and Lu (2009) recommend several strategies to improve the BCMA process in acute care settings:

- Forming an interdisciplinary committee to review user suggestions for BCMA customization and optimization.
- Including clinical staff in committees can provide insight on clinical area workflows.
- Developing a transparent issue-tracking process that prioritizes and shows the progress of tickets.
- Hosting an interdisciplinary committee meeting every two weeks to determine the process for handling each issue and allowing clinical staff to attend and support their recommendations through case study examples.
- Continuously identify gaps and the feasibility to improve workflow processes.
- Reinforce end-user training on BCMA technology and evaluate their confidence and competence regularly.
- Determine which stakeholders control the workflow process steps that give nurses the ability to change administration times that is congruent with workflows to eliminate the MAEs that require reasons for early/late administration by additional documentation.

Early, et al. (2011) suggests that pharmacy involvement can be facilitated by placing a container in the medication room for nurses to place empty vials and medication packages that are not scanning properly in, and that medication override reports should be evaluated to identify trends and problematic medications. The implementations that had the most profound effect on their BCMA scan rates included additional education and training and a new barcode label printer. Additionally, they created only four scenarios when a nurse can override the BCMA process: (1) computer system downtime, (2) patient not in the unit where BCMA was available, (3) emergent event, and (4) nursing message sent from the pharmacy. If the nurse was unable to identify with one of these categories, then a second nurse would have to verify the six rights of medication administration with their electronic credentials. These implemented interventions decreased the BCMA monthly overrides from 43,852 in October 2006 to 9,239 in April 2007. Nurse managers should consider posting the BCMA user scan rates in the lounge or bathroom.

Lastly, the most innovative QI solution found in the literature is to create (Gann, 2015) a RN-BCMA Coordinator position (Oroville Hospital, 2013). The BCMA coordinator can evaluate and solve issues that are specific with BCMA technology and support a rapid improvement in closing the gap between the deficiencies in BCMA scan rates and safe nursing practice; consequently,

mitigating legal implications. Through the continuous vigilance and collaboration with nursing, pharmacy, IT, quality, and risk, the BCMA coordinator can take the lead and manage the complex applications and train nurses on charting, new policies, troubleshooting, and updates (Staggers, Guo, Weir, & Iribarren, 2015) specific to their clinical areas. Evaluating the BCMA patient-scanning, barcode scanning compliance reports, near-miss and edit reports (Rybak & Ronk, 2015) from each department daily (Reisbig, 2015), the BCMA coordinator can communicate known problems (Patterson, Rogers, & Render, 2004) and address them promptly. Additionally, the charge nurses should print out a missed medication report before their shift ends to hold nurses accountable, and remind them to document why the medications were not given; this prevents a MAE and BCMA scan rate deficiency (Patterson, Rogers, & Render, 2004).



Once a BCMA-specific policy and procedure is established, a new BCMA education module should be created to reflect the updated evidence. Congruent with the literature review findings, Francoise Juste's Doctoral Dissertation (Staff Education Module for Bar Code Medication Administration, 2018) describes an education plan (validated by an expert committee) to increase BCMA compliance rates. Some of his recommendations (*) are listed below and should be incorporated in the BCMA education module:

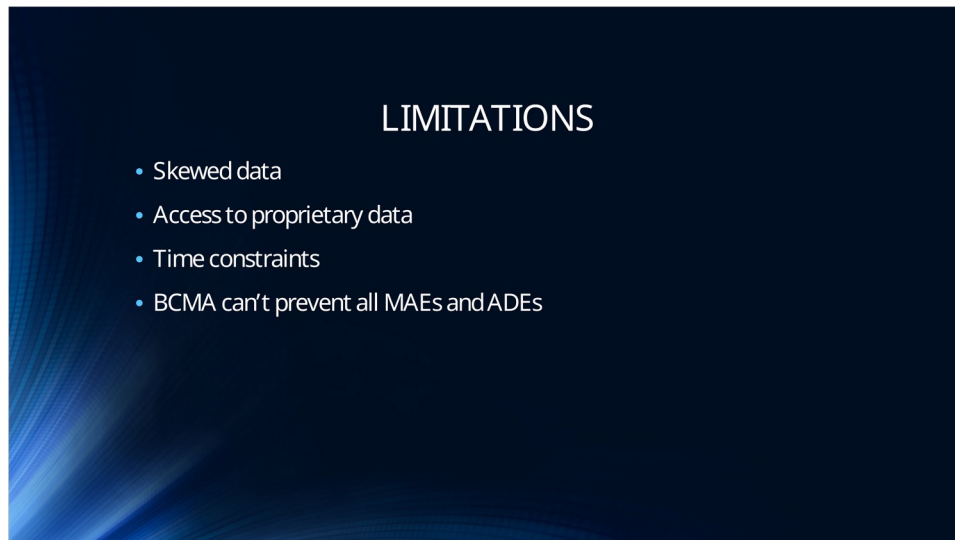
- Promote a positive culture of safety*
- Encourage transparency and a supportive work environment*
- Identify and explain the benefits of BCMA*
- Acknowledge workarounds significantly impact patient safety
- Understand the BCMA policy and procedure
- Demonstrate BCMA in a test environment
- Discuss and demonstrate the soft limits and hard stops in case scenarios*
- Demonstrate how to communicate and document medications that are not scanning*
- Discuss methods to communicate with the pharmacy
- Discuss acceptable overrides*
- Review downtime medication documentation forms and procedures
- Learn how to troubleshoot scanners when not working properly
- Demonstrate how to reach IT and submit a ticket
- Demonstrate how to print BCMA scan rate report
- Demonstrate how to print missed medications report
- Demonstrate how to submit an occurrence report

The BCMA education module will incorporate these objectives using a variety of learning methods that includes an In-service, PowerPoint presentation, manual with tip sheets, and the direct observation of nursing staff using BCMA.

2017 - 2018 BCMA SCAN RATES

EDs	2017	January 2018	February 2018	March 2018	April 2018
H.ED	88.8 %	91.7 %	91.0 %	90.4 %	92.2 %
HP.ER	94.9 %	95.3 %	94.1 %	96.4 %	96.4 %
HR.ER	97.9 %	97.9 %	97.6 %	97.7 %	98.4 %
HH.ERFS	97.4 %	98.8 %	97.8 %	98.5 %	98.7 %
HW.ERFS	96.7 %	98 %	95.6 %	97.0 %	96.1 %
Health System	95.4 %	96.34 %	95.22 %	96.0 %	96.36 %

Benchmark = 98 %



Currently, there is a Division-wide BCMA Initiative taking place. Several facilities in the Division have reported their efforts to increase their BCMA scan rates have been successful.

Access to proprietary data is limited to certain positions in the facility. Ideally, the prevalence of MAEs and ADEs would have been presented and assigned a monetary value.

Additionally, any sentinel events and legal claims directly related BCMA would reinforce the how critical it is for patient safety.

Time constraints prevented using survey tools, and individual and focused group interviews to capture quantitative and qualitative data.

BCMA will not prevent all the MAEs and ADEs . For example, BCMA systems will have no influence on the preparation of intravenous and non- intravenous medications.



OPPORTUNITY:
BCMA COORDINATOR

- Liaison: Admin, Clinicians, IT
- Monitors/reports status of change outcomes
- Recommends procedural, policy, workflow changes
- Test/verifies updates, patches, new releases of BCMA
- Disseminates new policy/procedures to staff
- Provides initial/ongoing BCMA training
- Designs/develops/updates training materials
- Participates in committees
- Provides support to Quality/Risk
- Develops/implements/monitors PI plans

The BCMA Coordinator is responsible for developing and implementing processes to improve the safety, efficacy, and efficiency of medication management processes associated with BCMA. A job description for a BCMA Coordinator was reviewed and several job duties were listed:

- Serves as a liaison between administration, clinical staff, and IT regarding BCMA medication management process.
- Monitors and reports effectiveness of change outcomes to management.
- Recommends procedural, workflow and policy changes as appropriate.
- Test and verifies updates, patches, and new releases of BCMA prior to activation.
- Disseminates information to end users on policies and procedures.
- Facilitates training, installation, maintenance, and overall use of BCMA throughout the hospital.
- Provides user support to nursing, pharmacy and other service lines by troubleshooting operational issues.
- Plans and ensures initial ongoing training for all BCMA users, students, and temporary staff.
- Designs, develops, updates, and maintains training documents within the facility.
- Actively participates in local facility multidisciplinary committee.
- Provides support to the Patient Safety Officer related to medication administration issues.
- BCMA Backup training and usage.
- Responsible for the initial configuration and maintenance of BCMA configuration files.
- Develops, implements, and monitors a performance improvement plan for the medication management process as it relates to BCMA.
- Actively participates in the Pharmacy and Therapeutics Committee

<http://www.orovillehospital.com/media/file/BCMA%20Coordinator%20Job%20Description.pdf>



BCMA SAVES LIVES



How many will you save?



Once again, I'd like to thank you for attending this presentation. I will now open the floor for any questions you may have.

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