

# The role of Bar Code Medication Administration System to prevent high alert medication errors

By

Suja P. Davis, RN, MSN

Clinical Assistant Professor, SON, UNC-CH

# What is High Alert Medications?

- ▶ According to the Institute for Safe Medication Practices, High Alert Medications are drugs that “bear a **heightened risk of causing significant patient harm** when... used in error.”

(as cited in Anderson & Townsend 2015)

# Characteristics of High Alert Medications

- ▶ Common causes of serious harm
- ▶ Narrow therapeutic index. As a result, minor changes in drug dosage or blood levels can lead to unintended effects.
- ▶ The risk of serious injury or death is high with the misuse of high alert medications
- ▶ Higher risk of system failure
- ▶ Adverse events are persistent, permanent, or slowly reversible and can lead to prolonged hospitalization.

( Anderson & Townsend 2015)

# Examples of High Alert Medications

- ▶ Mostly organization specific
- ▶ Anticoagulants
- ▶ Sedatives
- ▶ Insulin
- ▶ Opioids
- ▶ Chemotherapy meds
- ▶ Neuromuscular blockers

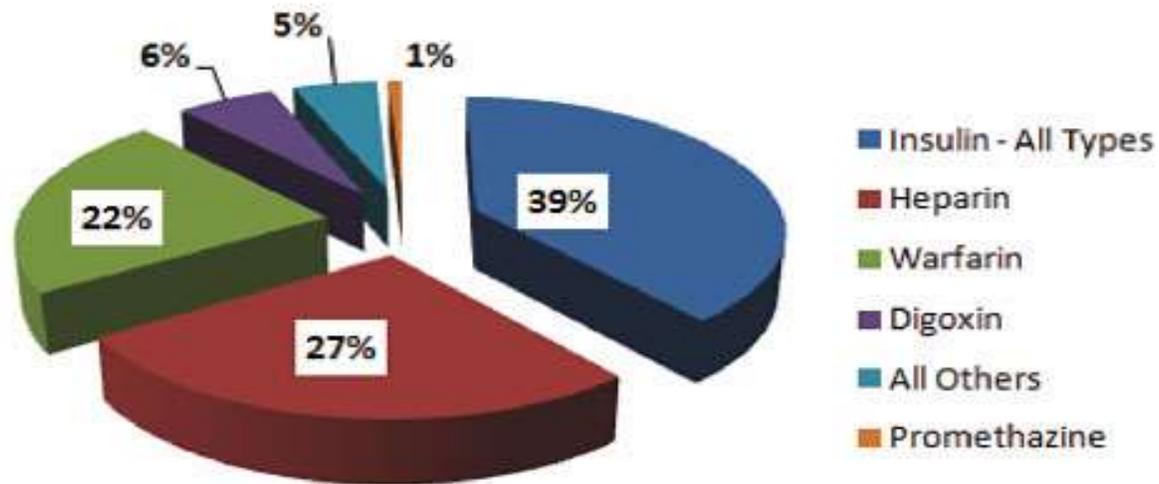
( Anderson & Townsend, 2015)

# Major Adverse Effects of Common High Alert Medications

Drug Category	Common adverse effects
Anticoagulants	Major bleeding such as GI bleeding, Intracranial bleeding and Retroperitoneal bleeding
Insulin	Hypoglycemia
Opioids	Over sedation, Profound hypotension, respiratory depression & respiratory arrest
Sedatives	Over sedation, respiratory and cardiovascular depression, respiratory arrest

(Anderson & Townsend, 2015)

# High-Alert Medication Errors by Harm Category 2006-2008



\* Harm as indicated by NCC-MERP categories E-I

# Medication Delivery in an acute care setting

► Three important steps associated with medication delivery

1. Ordering of medications by the practitioner
2. Preparing the medication by the pharmacist
3. Administering the medication by the nurse

Safety cues:

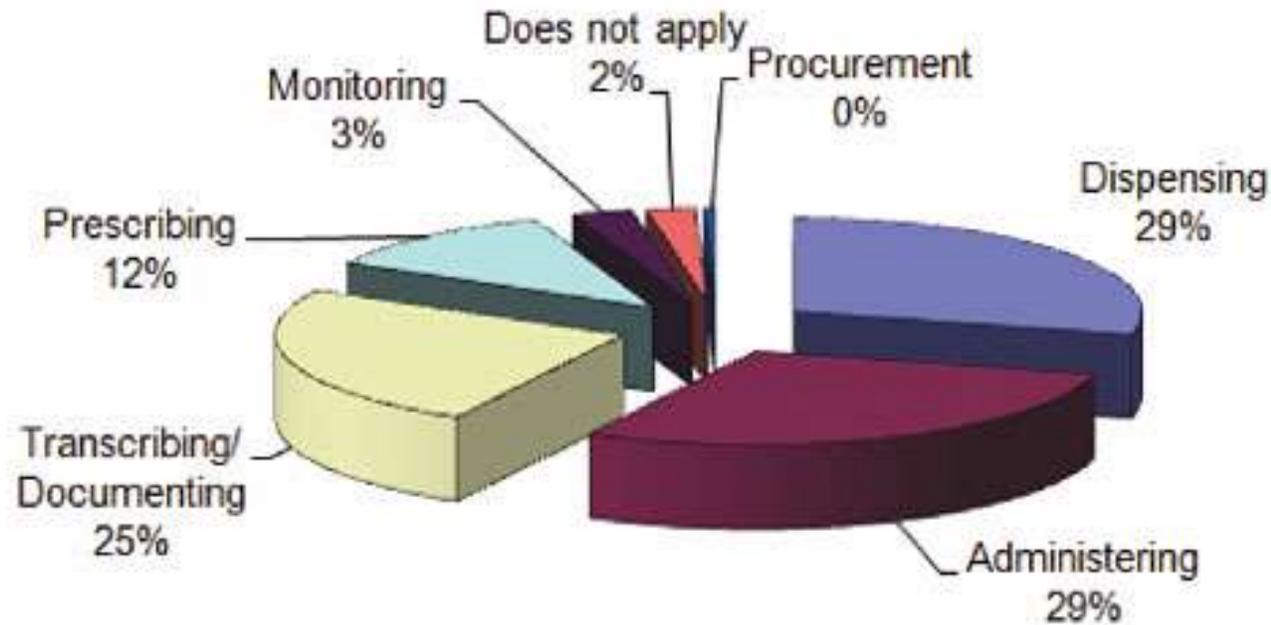
If the practitioner makes a mistake, both pharmacist and nurse have a chance to correct it.

If the pharmacist makes a mistake, the nurse has a chance to correct before it reaches to the patient.

If the nurse makes a mistake, errors are more likely to reach the patient

(Anderson & Townsend, 2015)

# High-Alert Medication Errors by Type of Error Category 2006-2008



Rasheedi et al, 2009

# Bar Code Medication Administration

- ▶ How does it work ?
- ▶ The BCMA system consists of a mobile computer with internet connection, a hand held barcoding scanner, patient identification bracelets and personal log in ID/ badge for the RN



# Effect of BCMA with Medication errors

- ▶ Right drug 75% improvement
- ▶ Right dose 62% improvement
- ▶ Right patient 93% improvement
- ▶ Right time 87% improvement
- ▶ Missed meds 70% improvement

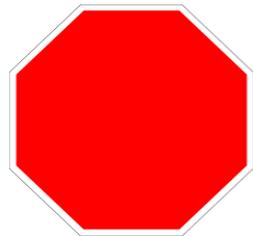
(Johnson et al, 2002)

# The Role of BCMA in reducing medication errors

- ▶ Independent double checks



- ▶ Triggering alerts



# Independent double checks

- ▶ BCMA has the provision to include the signature of the second verifier to witness, verify the five rights of medication administration and then cosign the medication.
- ▶ Independent double check - double check/verification process using a pop box in the medication administration computer screen for high alert medications that allowed the electronic countersignature of the second verifier
- ▶ According to ISMP, 95% of medication errors can be prevented using independent double checks before they reach the patient.
- ▶ The independent double check helps to improve the level of trust between nurses and patients as patients witness independent double check as a safety measure

(Anderson & Townsend, 2015 ; Baldwin & Wash,2014)

# Independent double checks

- ▶ According to a report in Alberta RN (2009), Independent double checks are important to prevent endogenous errors which is originated from an individual as a result of a mental slip.
- ▶ Involvement of two RN which can avoid the endogenous errors arise within one person.
- ▶ The second RN performing the independent double check “may not follow the same faulty thinking and is likely to detect the error.

# Independent double check- How does it work

The image shows a hand-drawn screenshot of a medical software interface. At the top, there is a menu bar with icons for help, search, and other functions. Below the menu bar, there are several buttons: "Select Patient", "Clear Patient", "Patient Sticky Notes", and "Exit Program". A patient's name and MRN are displayed: "Smith, J- Age / Gender: 75, Male - MRN: 0185325". Below this, there is a field for "Allergies: PCN, Morphine". The main area of the interface is divided into two columns. The left column contains input fields for "Regular Insulin", "Units" (with the value "5"), "Time" (with the value "11:30AM"), and "Blood Sugar" (with the value "285 mg/dl"). The right column contains a "Comments:" field and a "Complete" button. At the bottom right, there is a "Next" button. The interface is drawn with a blue border and a white background, with various icons and text elements.

# Independent double check- How does it work

- ▶ After hitting the complete and next button, a pop up box will open up for the second RN to verify medications with 5 rights and the related monitoring with medications.



User Name

Password

Login

# Other strategies to ensure independent double check

- ▶ Creation of a personalized bar code identification card for each nurse that can be scanned quickly instead of manual entry for independent double check.
- ▶ The personalized bar code identification card was developed to create a standardized process across nursing units to reduce medication errors associated with high alert medications in a VA facility in Texas.
- ▶ The study results show that nurses followed the directions and abided with personalized ID bands with high alert medication administration which tend to reduce the medication errors

(Thomas, 2013)

# Evidence and Research about BCMA Alerts

- ▶ Miller, Fortier & Garrison (2011) conducted a study to evaluate the type of medication alerts triggered by BCMA technology to detect potential medication errors involving high alert medications at Medical University of South Carolina.
- ▶ Medication alerts were generated by BCMA for the following
  - ▶ Order discrepancies with no order found
  - ▶ No schedules found
  - ▶ Incorrect amount
  - ▶ Administration too early
  - ▶ Administration too late
- ▶ The clinician is expected to respond back to alert by cancelling the administration, follow up in accordance with the message or override the alert with a justification.

# Evidence and Research about BCMA Alerts

## ▶ Study Results

- ▶ The most common alert messages were related to incorrect amount (65%), followed by administration too late (29%), administration too early (4%) and no order for schedules found (2%)
- ▶ The study results highlighted that 55% of the generated alerts were related to high alert medications. Insulin aspart, NPH insulin, Hydromorphone injection, intravenous potassium chloride and morphine injection were responsible for 85% of all high alert medication system alerts

- ▶ **Conclusion** : The alerts created by BCMA was powerful to prevent high alert medication errors by alerting the clinicians to take the necessary steps to prevent an error.

(Miller, Fortier & Garrison (2011))

# Potassium and BCMA Alert

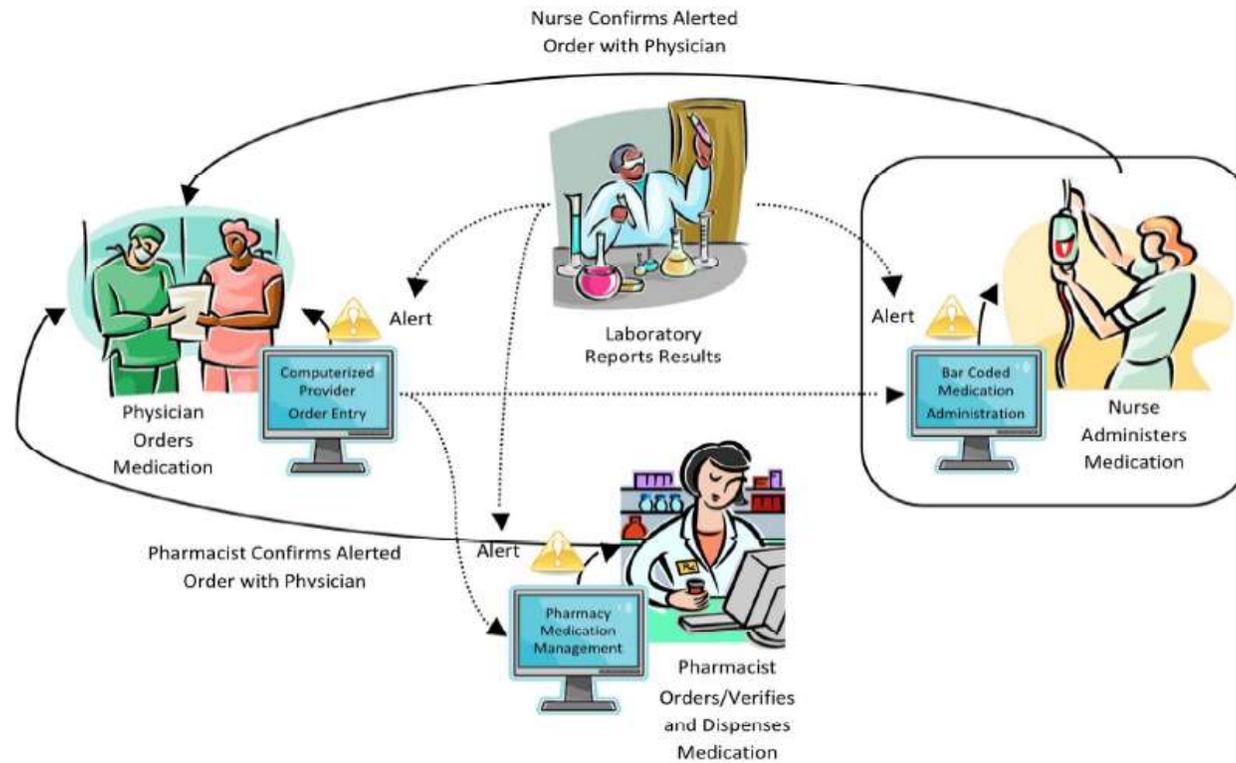


Figure 1: Bar Coded Medication Administration in the Medication Administration Process

Reference : Radecki et al

# Potassium and BCMA change

- ▶ Radecki et al conducted a study at the University of Texas Health sciences center at Houston to evaluate the effectiveness of bar coded medication alerts for elevated potassium to prevent life threatening complications of hyperkalemia.
- ▶ The BCMA hyperkalemia alert was set for potassium level > 5.5mg/l

Table 1: BCMA Alert Acceptance by Order Type

Medication Order Type	Total	Alert Accepted (%)	Subsequently Overridden
Potassium Supplement	403	115 (28.5)	35
Potassium-Containing Nutrition	119	5 (4.2)	5
Primary IV solution with potassium additive	120	10 (8.3)	6

# BCMA alerts for Chemotherapy Administration

Levy et al (2011) discussed different safety alerts created by BCMA for chemotherapy administration at Vanderbilt University's Hematology and Oncology Department. It include:

- ▶ Missing order alert - No matching order found for the scanned drug
- ▶ Wrong dose alerts - Dose of the drug scanned does not match the total dose to be administered
- ▶ Wrong route alert - drug order is matching, but the route is incorrect. (e.g. oral vs. intravenous)
- ▶ Wrong schedule alert - the drug order is matching, but the nurse is attempting to give it too early or too late.

# BCMA alerts for Chemotherapy Administration

Additionally the BCMA system offered audit reports to the charge nurse.

- Missed dose report : The charge nurse could generate a list of medications not administered or not documented to follow up for errors of omission at the end of the shift.
- Non compliance with independent double check : If Second RN's signature is missing for a medication which requires an independent double check, the charge RN can capture it at the end of the shift. This report is really valuable to provide real time feedback on documentation compliance and an opportunity for education to reinforce such policies.

(Levy et al , 2011)

# Conclusion

BCMA is a powerful tool to prevent and reduce the high alert medication errors through independent double checks and triggering alerts for further follow up.

Questions???

# References

- ▶ Anderson, P., & Townsend, T. (2015). Preventing high alert medication errors in hospital setting. *American Nurse Today*, 10 (5), 18- 22.
- ▶ Baldwin K., & Walsh V. (2014). Independent double-checks for high-alert medications: essential practice. *Nursing* ,44(4),65-67
- ▶ Independent double checks are vital, not perfect (2009). *Alberta RN*, 65 (4), 22-23.
- ▶ Johnson, C.L., Carlson, R.A., Tucker, C.L., & Willette, C. (2002). Using BCMA software to improve patient safety in Veterans Administration Medical Centers. *Journal of Healthcare Information Management*, 16 (1), 46-51.
- ▶ Levy, M.A., Giuse, D.A., Eck, D.C., Holder, G., Lippard, G., Cartwright, J. & Rudge, N.K. (2011). Integrated information systems for electronic chemotherapy medication administration. *Journal of Oncology Practice*, 7(4), 226- 230.

# References

- ▶ Miller, D.F., Fortier, C.R. & Garrison, K.L. (2011). Barcode medication administration technology: Characterization of high alert medication triggers and clinician workarounds. *The Annals of Pharmacology*, 45 ( ), 162-168.
- ▶ Radecki, R. P., McCoy, A. B., Sirajuddin, A. M., Murphy, R. E., & Sittig, D. F. (2012). Effectiveness of Bar Coded Medication Alerts for Elevated Potassium. *AMIA Annual Symposium Proceedings, 2012*, 1360-1365.
- ▶ Rashidee, A., Hart, J., Chen, J., & Kumar, S. (2009). High alert medications: Error Prevalence and severity. Retrieved from <https://hsl.lib.unc.edu/tutorials/apastyle>
- ▶ Thomas, M. (2013). Evaluation of the personalized barcode identification card to verify high risk high alert medications. *Computers, Informatics, Nursing*, 31(9), 412-421.