

An Evidence-Based Evaluation of Medication Barcode Scanning Acceptance in a Community Hospital

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Objectives

At the completion of the session, the participants will be able to:

- ▶ Discuss factors that influence the acceptance of medication barcode scanning.
- ▶ Discuss a process for evaluating the acceptance of medication barcode scanning.
- ▶ Name at least one practice change that could be implemented to improve the acceptance of medication barcode scanning in the participants' practice setting.

Problem Statement

Barcode Medication Administration (BCMA) →

Evidence-based practice for safe medication administration

- ▶ Preponderance of Evidence: BCMA decreases medication administration error/increases medication accuracy rates (Hassink et al., 2012)
 - 41.4%, $p < .001$ (Poon et al., 2010) to
 - 80.7%, $p < .001$ (Bonkowski et al., 2013)
- ▶ Leapfrog Group – New in 2016
 - Launched on April 1st, results reported by hospital in late July
 - Factsheet: Bar Code Medication Administration. Retrieved from http://www.leapfroggroup.org/sites/default/files/Files/BCMA_FactSheet.pdf

Problem Statement (cont.)

Lack of adoption and acceptance of BCMA.

- ▶ VHA hospitals - Ethnographic studies (Patterson et al. 2002, 2006)
Lack of scanning medications and patient ID bands observed
- ▶ Koppel et al. (2008) – 307,698 medication administrations
10% of alerts ignored
- ▶ Early et al. (2011) – Medication scanning compliance was 82%
- ▶ Pedersen et al. (2013) - 65.5% of hospitals have implemented BCMA systems
- ▶ Contributors to lack of scanning:
 - Lack of available, functioning equipment
 - Issues with patient ID bands (damaged, worn)
 - Issues with medication barcodes

Methods

Setting: A community hospital in a rural setting in the mid-west

- Sixty-one acute care beds
- BCMA utilized in:
 - Acute inpatient, intensive care, and obstetrics
 - Emergency department
 - Surgical services: patient holding, post-anesthesia care area, and endoscopy
- Nurses and respiratory therapists used BCMA

Methods

- ▶ Staff perception survey, based on the technology acceptance model (TAM; Davis, 1989; Holden & Karsh, 2010)
- ▶ TAM derived from: Theory of Planned Behavior (Ajzen, 2011; Ajzen & Fishbein, 1969)
 - An individual's behavior → influenced by their intention
 - Behavioral intention → determined by an individual's beliefs, and if "important" others and most people support the behavior
- ▶ There are several TAM-based surveys. Holden et al. (2012) survey:
 - Specific to BCMA
 - Included additional variables specific to healthcare environment

Methods





Survey Variables:

- Perceived Ease of Use, Perceived Usefulness, *Perceived Usefulness for Patient Care*
- Influence of Others, *Staff Beliefs: Patient Perceptions*
- Training, Technical Support
- Intention to Use, Satisfaction

Survey had 32 questions with a seven-point rating scale

Cronbach's $\alpha > .80$ for subscales
(except $\alpha > .70$ for PEOU & Influence of Others, Intention to Use [Holden et al., 2012], Satisfaction [project])

Methods: Frames Conceptual Model as a Guide

- ▶ Frames
 - Mental models or maps (Bolman & Deal, 2013)
 - Synthesize data and information into patterns, efficient
 - Guided the project
- ▶ BCMA Assessment at the Community Hospital
 - Structural (factory): Wireless scanner on a mobile cart, BCMA policy 
 - Human resources (family): Informatics Nurse & IT staff 
 - Political (jungle): No competition 
 - Symbolic (social & cultural anthropology): Story-telling used about the impact of BCMA 

Results

Participants:

- ▶ 30% response rate (44/143)
- ▶ Experienced in their role and with computer use
 - Years in current role $M = 10.43$ ($SD = 10.67$)
 - Computer use at work $M = 9.90$ ($SD = 6.77$) years; at home $M = 15.27$ ($SD = 5.85$) years
- ▶ 41% of respondents were 30 to 39 years of age; 41% were 40 to 59 years old.

There was no significant difference when the mean ranks for the age categories were compared for the nine subscales

Results

All questions/Subscales

- ▶ Mean scores for all questions: 3.19 to 4.96 on a seven-point scale
- ▶ Staff were in general satisfied with BCMA and intended to use it

Highest Scores for the Nine Subscales

- ▶ Intention to use BCMA variable ($M = 4.96$, $SD = 1.42$)
- ▶ Influence of others variable ($M = 4.74$, $SD = 1.76$)

Lowest Scores

- ▶ Technical support variable ($M = 3.20$, $SD = 1.88$)
- ▶ Training variable ($M = 3.2$, $SD = 3.19$)




Significance and Discussion

- ▶ Community Hospitals have Unique Challenges
- ▶ Leadership Support Matters
- ▶ Opportunities to Continuously Improve are Plentiful
- ▶ New Key Stakeholders are Emerging – Dwell in Possibility
- ▶ Frameworks and Evidence-Based Tools are Vital Guides

Significance: Community Hospitals' Unique Challenges

- ▶ Consider the interaction of the Community Hospital within the macro-system
 - *Is the community hospital "voice" being represented/heard?*
- ▶ Be aware of *appropriate* variations in practices/Unique patient populations
 - *Patients' own behavioral health medications in a vial in an ambulatory clinic (pedigree cannot be verified and med cannot be scanned)*
 - *Amish – Significant patient teaching needed related to the safety purpose of technology*
- ▶ Unique interprofessional team roles
 - *Nursing and Respiratory Therapy have some overlap in scopes of practice (nebulizer treatments during the night in ED)*
 - *Perceived Usefulness and Usefulness for Patient Care: Similar results for Respiratory Therapy, Obstetrics, and Surgical Services*

Significance: Leadership Support Matters

- ▶ Hospital
 - Culture of Safety and Structure for Leadership Rounds 
 - Told "stories" of BCMA at Daily Check-In's 
 - Managers reached BCMA scanning compliance reports 
- ▶ *Influence of Others:*
 - High subscale rating (i.e. Survey Participants believed "leadership" expected BCMA)

Significance: Improvement Opportunities are Plentiful

Use of technology does not ensure there are not improvement opportunities.

- ▶ The hospital had used BCMA for several years
- ▶ Some processes had not been maintained
 - Process to return non-scanning meds to Pharmacy
- ▶ Through the project new processes emerged
 - Registration clerks discussing BCMA with patients & families

Significance: New Stakeholders

New Key Stakeholders Emerged – Dwell in Possibility

- ▶ This project included Respiratory Therapists
- ▶ Key survey result: Patients and families *value BCMA a moderate amount*
 - **Patient and Family Advisory Council** gave additional input
 - **Registration Clerks:** Placed ID bands (used for scanning) on almost all patients
 - New Process: Standard work and patient information statement (5th grade level) used by Registration Clerks when the ID Bands are placed

Significance: Frameworks and Evidence-Based Tools

Frameworks & Evidence-Based Tools →
Vital to Guide Nurses in Process Improvement Work

- ▶ Technology Acceptance Model-based Instruments
- ▶ Frames Model

Lessons Learned

- ▶ Collaboration and confirmation with the organizational leadership is crucial for a successful project
- ▶ Use mixed-methods research design in conjunction with quality improvement techniques
- ▶ Dwell in possibility
 - New stakeholders
 - Different framework to guide the project

Wrap-Up

- ▶ What unique circumstances, such as medications, patient populations, etc. might be barriers to BCMA in your organization?
- ▶ Using Frames (Bolman and Deal, 2013) what structures, human resource practices, symbols are in place that support or hinder BCMA at your organization?
- ▶ What new key stakeholders at your organization could provide BCMA acceptance and adoption support?

Questions?



Keep on Scanning!

References

- Ajzen, I. (2011). The theory of planned behavior: Reactions and reflections. *Psychology and Health, 26*, 1113-1127. doi:10.1080/08870446.2011.613995
- Ajzen, I., & Fishbein, M. (1969). The prediction of behavioral intentions in a choice situation. *Journal of Experimental Social Psychology, 5*, 400-416.
- Bolman, L. G. & Deal, T. E. (2013). *Reframing organizations: Artistry, choice, and Leadership* (5th ed). San Francisco: Jossey-Bass.
- Bonkowski, J., Carnes, C., Melucci, J., Mirtallo, J., Prier, B., Reichert, E., . . . Weber, R. (2013). Effect of barcode-assisted medication administration on emergency department medication errors. *Academic Emergency Medicine, 20*, 801-806.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *Management Information Systems Quarterly, 13*, 319-340.

References (cont.)

- Early, C., Riha, C., Martin, J., Lowdon, K. W., & Harvey, E. M. (2011). Scanning for safety: An integrated approach to improved bar-code medication administration. *CIN: Computers, Informatics, Nursing*, 29, (TC4), TC45-TC52.
- Hassink, J., Jansen, M., & Helmons, P. (2012). Effects of bar code-assisted medication administration (BCMA) on frequency, type and severity of medication administration errors: A review of the literature. *European Journal of Hospital Pharmacy*, 19, 489-494. doi:10.1136/ejpharm-2012-000058
- Holden, R. J., & Karsh, B.-T. (2010). The technology acceptance model: Its past and its future in health care. *Journal of Biomedical Informatics*, 43, 159-172. doi:10.1016/j.jbi.2009.07.002
- Holden, R. J., Brown, R. L., Scanlon, M. C., & Karsh, B.-T. (2012). Modeling nurses' acceptance of bar coded medication administration technology at a pediatric hospital. *Journal of the American Medical Informatics Association*, 19, 1050-1058. doi:10.1136/amiajnl-2011-000754

References (cont.)

- Koppel, R., Wetterneck, T., Telles, J. L., & Karsh, B.-T. (2008). Workarounds to barcode medication administration systems: Their occurrences, causes, and threats to patient safety. *Journal of the American Medical Informatics Association*, 15, 408-422. doi:10.1197/jamia.M2616
- Pedersen CA, Schneider PJ, Scheckelhoff DJ. ASHP national survey of pharmacy practice in hospital settings: Monitoring and patient education—2012. *Am J Health Syst Pharm*. 2013;70(9):787-803.
- Poon, E. G., Keohane, C. A., Yoon, C. S., Ditmore, M., Bane, A., Levtzion-Korach, O.,... Gandhi, T. K. (2010). Effect of bar-code technology on the safety of medication administration. *New England Journal of Medicine*, 362, 1698-1707