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Original Research

Pharmacy workers' perceptions and acceptance of bar-coded medication technology in a pediatric hospital

Richard J. Holden, Ph.D.[a,b,*], Roger L. Brown, Ph.D.[c], Matthew C. Scanlon, M.D.[d], Ben-Tzion Karsh, Ph.D.[e,f,g]

[a]*Department of Medicine, Vanderbilt University, Nashville, TN, USA*
[b]*Department of Biomedical Informatics, Vanderbilt University, Nashville, TN, USA*
[c]*Clinical Health Science, School of Nursing, University of Wisconsin-Madison, Madison, WI, USA*
[d]*Division of Critical Care, Department of Pediatrics, Medical College of Wisconsin, Wauwatosa, WI, USA*
[e]*Department of Industrial & Systems Engineering, University of Wisconsin-Madison, Madison, WI, USA*
[f]*Department of Family Medicine, University of Wisconsin-Madison, Madison, WI, USA*
[g]*Department of Population Health Sciences, University of Wisconsin-Madison, Madison, WI, USA*

Abstract

Background: The safety benefits of bar-coded medication-dispensing and administration (BCMA) technology depend on its intended users favorably perceiving, accepting, and ultimately using the technology.
Objectives: (1) To describe pharmacy workers' perceptions and acceptance of a recently implemented BCMA system and (2) to model the relationship between perceptions and acceptance of BCMA.
Methods: Pharmacists and pharmacy technicians at a Midwest U.S. pediatric hospital were surveyed following the hospital's implementation of a BCMA system. Twenty-nine pharmacists' and 10 technicians' self-reported perceptions and acceptance of the BCMA system were analyzed, supplemented by qualitative observational and free-response survey data. Perception-acceptance associations were analyzed using structural models.
Results: The BCMA system's perceived ease of use was rated low by pharmacists and moderate by pharmacy technicians. Both pharmacists and technicians perceived that the BCMA system was not useful for improving either personal job performance or patient care. Pharmacy workers perceived that individuals important to them encouraged BMCA use. Pharmacy workers generally intended to use BCMA but reported low satisfaction with the system. Perceptions explained 72% of the variance in intention to use BCMA and 79% of variance in satisfaction with BCMA.
Conclusions: To promote their acceptance and use, BCMA and other technologies must be better designed and integrated into the clinical work system. Key steps to achieving better design and integration include measuring clinicians' acceptance and elucidating perceptions and other factors that shape acceptance.

Keywords: Bar-coded medication-dispensing and administration systems; BCMA; Technology acceptance; Pediatric hospital

* Corresponding author. Center for Research and Innovation in Systems Safety, Vanderbilt University School of Medicine, 1211 21st Ave. S, Ste. 732 MAB, Nashville, TN 37212, USA. Tel.: +1 615 936 4343; fax: +1 615 936 7373.
E-mail address: Richard.Holden@vanderbilt.edu (R.J. Holden).

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Medication errors may be as prevalent as 1 per day for the average hospitalized patient.[1] Administration errors are especially common and, compared with errors occurring at other medication management stages, have a low probability of being intercepted.[2] Bar-coded medication-dispensing and administration (BCMA) technology is recommended as a way to prevent inpatient medication administration errors and to detect errors before they cause harm.[3,4] Recent studies by Poon et al[5,6] offer evidence that BCMA improves medication-dispensing and administration safety. However, there was also evidence that pharmacy workers perceived the BCMA system to worsen work performance, leading to staff resistance.[7] Research on nurses shows that nurses use numerous work-arounds and often override BCMA systems.[8,9] Work-arounds, overrides, and similar behaviors partially result from clinicians' low acceptance of the health information technology (HIT) in question and low acceptance, in turn, may be caused by unfavorable perceptions concerning the HIT.[10] It is therefore important to assess clinicians' perceptions and acceptance of new HIT and to identify those perceptions associated with HIT acceptance.[11] However, nurses' perceptions and acceptance of BCMA are seldom studied,[12,13] and studies of pharmacy workers' perceptions and acceptance are entirely absent. Thus, this study's 2 objectives were as follows: (1) to describe hospital pharmacists' and pharmacy technicians' perceptions and acceptance of a recently implemented BCMA system and (2) to model the relationship between perceptions and acceptance of BCMA. Although it is important to measure a variety of BCMA-related perceptions following BCMA implementation (Objective 1), it is equally as important to find out which of these perceptions is driving workers' acceptance of BCMA (Objective 2). The latter allows a more focused approach to generating solutions to improve BCMA acceptance and use.

Conceptual framework

The study's conceptual framework (Fig. 1) is adapted from the Technology Acceptance Model (TAM), a family of theories—TAM,[14] TAM2,[15] and TAM3[16]—that posit a causal relationship: between (1) user perceptions of technology and user acceptance and (2) acceptance and actual use.[a] TAM is the most widely used theoretical framework in the HIT acceptance and use literature, although no previous work has used TAM to study BCMA or pharmacy workers.[11] Following TAM, this study assessed 3 categories of BCMA perceptions:

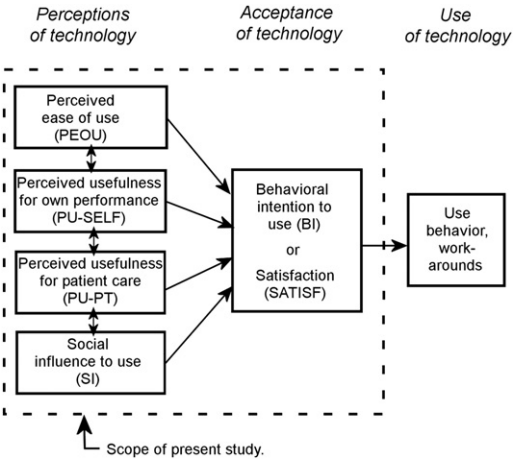

Fig. 1. The study's conceptual model, depicting a relationship between several perceptions of technology and technology acceptance, conceptualize as behavioral intention to use and/or satisfaction with technology. A relationship between acceptance and use behavior is posited but not within the scope of the present study.

- Perceived ease of use (PEOU), or "the degree to which a person believes that using a particular system would be free of effort."[14(p320)]
- Perceived usefulness (PU), or "the degree to which a person believes that using a particular system would enhance his or her job performance."[14(p320)] Holden and Karsh[11] note that PU is often defined in terms of usefulness for the user's productivity on the job (PU-SELF) but that in health care settings, PU can also be thought of in terms of usefulness for improving patient care (PU-PT). PU-SELF and PU-PT were both measured in this study.

[a] The Technology Acceptance Model (TAM) was originally developed in the mid-1980s to explain variation in technology use behavior. It was adapted from the Theory of Reasoned Action (TRA), a social-psychological theory applicable to a wide range of behaviors. As TRA was updated and evolved into the Theory of Planned Behavior, similar updates were made to subsequent versions of TAM. Some, although not all, of those updates are reflected in the models tested in this study.