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The expectations of nurses about the implementation of a barcoded medication administration system: a qualitative study

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Abstract: The implementation of a health system like the Barcode Administration System (BCMA) often disrupts the workflow of nursing staff. Taking into account that system acceptance by nurses is one of the most important factors for successful implementation, this paper describes nurses' expectations regarding the introduction of BCMA. For this purpose, interviews were conducted with 18 nurses in different units of an academic medical center in Argentina. Analysis of the interviews produced six main themes. Among these themes two factors were identified as determinants for system acceptance: ease of use perceptions and usefulness.

Keywords: Barcode Medication Administration (BCMA), patient safety, implementation strategies, qualitative studies

Introduction

Literature reviews show that more than a million injuries and between 44,000 and 98,000 deaths per year are attributable to medical errors in the United States. [1] Preventable adverse events occurred most often during ordering (56%) and administering (24%) medication [2]. In a recent study of the Analysis of Event Reports, it was found that 43.4% of errors related to medication occurred during the administration stage [3]. Studies have demonstrated a reduction of 54% to 86% in error rates of drug administration with the introduction of the Barcode Medication Administration (BCMA). BCMA is also important for improving both the accuracy in the administration of medication and the quality and completeness of medication records [4,5].

BCMA requires the introduction of new technology into the daily work of nurses. The introduction of such an innovation has the potential to disrupt work routines [6].

In order to fit the innovation to the work environment, a thorough and comprehensive analysis is required of the norms, standards and work culture involved. Workflow must also be redesigned or the implementation could fail. Lack of system acceptance by users has been described as one of the major barriers to BCMA implementation [7].

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The aim of this study was to understand nurses' expectation about BCMA and through this understanding provide adequate future implementation of local processes and user preferences, with the objective of improving the acceptance of new technology.

1. Methods

We performed a qualitative study to explore nurses' perceptions of a future BCMA implementation. Data was obtained via individual, face-to-face, semi-structured interviews with nurses from seven wards of Hospital Italiano de Buenos Aires (HIBA) between March 2011 and October 2012

HIBA is a non-profit academic medical center. It has two hospitals and 24 outpatient clinics. HIBA's Health Information System (HIS) includes a problem-oriented patient-centered electronic medical record (home-grown system) that is used by all nurses.

We began the study with nurses from two units where BCMA implementation was going to occur in the study's first phase and continued interviewing nurses from other units during the second phase of the study.

Data was collected over a period of four weeks in the first phase and a period of six weeks for the second phase. Interviews usually lasted between 20 and 30 minutes and all of them were recorded

A purpose sample was performed. A nurse informatics specialist assisted in identifying key informant nurses. For a broad spectrum of responses, different profiles were interviewed in terms of gender, age, role and work shift.

A literature review of different papers about BCMA implementation was completed and then the primary investigator defined a set of criteria defining possible themes for developing the interview guide. Changes in the workflow, possible benefits and possible problems and issues in the ongoing implementation process became the focus for questions.

Two of the investigators (VT and DB) transcribed the interviews. The words of those interviewed were utilized to create a first list of codes. Then, the two investigators independently reviewed the field notes and organized themes using spreadsheet software (Microsoft Excel, Redmond, WA). As a result, a coding tree was built around the key themes. Within these themes, different levels of codes were constructed. Following on, the two investigators performed a second round of reviewing transcripts using final categorization and discussed the concluding results. We also performed member checking, reviewing our results with a subset of our subjects to ensure we had accurately captured meaning.

Categories, themes, codes and quotes were used together to guide the summary and interpretation of the results. Quotes are expressed in English but were translated from Spanish.

2. Results

18 Nurses were interviewed, five from the ICU and the rest from general wards. The average age was 34. Three nurses worked on weekends during two morning shifts and

three afternoon shifts, and the rest worked during weekdays After analysis, six themes were developed; they are stated below:

Medication administration process theme: When nurses were asked about changes that they thought would appear while administering medication, several subthemes emerged. These subthemes were included in subsequent interviews for a deeper understanding.

One of the mains advantages that nurses visualized was an improvement in patient identification. “We will know that we're facing the correct patient”. With the development of this system, patients will use a wristband containing patient identification information. Nurses thought that this could be a positive change, that is, “the benefits of knowing who we are assisting”. However, it was also mentioned that too many of the wristbands will need to be changed because they become blurred or stained and the patient may have to wait hours or days to receive a new one.

Another subtheme that emerged was related to the identification of medication. “We have a certain amount of medications that have many similarities and although they are different drugs they are visually identical”. With BCMA, nurses expected improvements in the identification of medications.

Nurses expect this system to improve patient safety by decreasing medication errors. To verify the correct administration of the medication to the patient, nurses have to check the five 'corrects' or five 'rights': right patient, right drug, right dose, right route and right administration time. BCMA facilitates this process and nurses were aware of this: “We use the verification of the five Rights to administer medication to the patient, the right patient, the right dose, etc. ... but that is a process that we do mentally, so sometimes we forget something… This system will help us to verify the five rights and decrease errors".

Another process that will change is the recording of the drugs that are administered. Nurses perceive it as a good change that could improve record completeness and quality. “Everything is recorded and there won't be errors”

Trust /Distrust: It was noted in interviews that the new system could give nurses peace of mind and security. “ The system gives us a sense of security and safety ... for the patient and for us, too …we will have the peace of mind that what we're administering is what really needs to be given to that patient”. One of the concerns mentioned in one interview concerned security in the medication preparation process: “How sure can I be that the syringes will contain the correct medication and have been correctly prepared?”

Professional development: Some nurses associated the new technology with professional advancement through statements like “decreasing the possibility for error,” and “we will become more skilled”.

Nurse-patient relationship: Some nurses were fearful about BCMA interfering in relationships with their patients and as a result creating discomfort for patients and/or nurses. They asked themselves what the patient's reaction would be upon seeing nurses scanning the medication before its administration. “I think the patient might feel uncomfortable if we check the medication in front of them”. One nurse mentioned that patients might be suspicious of the use of new technologies if they do not understand or have not had previous experience of

said technology. Another nurse stated that the new interventions could generate distrust among patients, which could lead to them feeling uncomfortable.

Technical issues: In the interviews, nurses were concerned about a number of different technical problems, such as the use of wired devices. They mentioned that this could make it problematic to work within patients' rooms. "I don't know if the cable will be long enough … if we are going to be at the bedside with a device that is not wireless we are going to have problems with cable lengths".

Nurses were worried about their training needs and stated several times, "I don't know how the system will work, it is difficult to imagine". Furthermore, they also verbalized the necessity for someone that knew how to use the system to accompany them during the first months of its implementation. "When the implementation starts, I would like to have some nurses trained in using the new system during every shift to help us with the system use".

Implementation process: One theme that emerged during the interviews was the nurses' need for being involved during the implementation process. "Communication and frequent meetings … it is important that we have meetings when we start working with this new technology to be aware of new problems that may arise". Effective and efficient communication between those involved will make it possible to analyze the implementation's weaknesses and problems, and also to find solutions to them.

Offering support is a good way of making the user feel comfortable during implementation. This need was explicitly stated in some interviews, for example, "When the implementation starts I would like to have super-user nurses on every shift to help us with the system".

3. Discussion

It is important to consider, as described by the Technology Acceptance Model [8], that a prerequisite for the adoption of technology is given by the attitude displayed towards it. This factor is based on two aspects: ease of use and usefulness. By linking nurse interviews with these two determinants, we noted that the nurses associated this introduction of technology with important factors such as effectiveness, increased productivity, having more complete patient records, higher care quality, as well as a decrease of errors as factors associated with usefulness. Nurses also mentioned that the introduction of this technology can be related to personal growth, hospital growth and better patient care. Nurses also mentioned reservations regarding the introduction of new technology, such as a lack of knowledge about using the system and the need of training, which will be crucial to the process of adopting BCMA.

The expressed need for communication and support has been described as an important step for effecting changes in management [9]. Also described by Novack et al. institutionally supported clinicians who facilitate adoption and use of health IT systems can improve the safety and effectiveness of implementation through the management of unintended consequences [10].

This paper has some limitations, as we only assessed one institution, an academic medical center; thus, we might be able to find different opinions if we replicate the study in other healthcare institutions. As a qualitative study, there were some limitations implicit in the methodology; we tried to diminish these by using different

strategies to rigorously enhance trustworthiness, such as reflexivity, triangulation and member checking.

This study has given us a better understanding of the preferences, concerns and expectations of nurses regarding the introduction of a new technology. As a future work, we expect to be performing new qualitative findings in a bid to understand nurses' preferences at the point where the technology will be available in Hospital Italiano de Buenos Aires.

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