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Transitioning from a computerized provider order entry and paper documentation system to an electronic health record: Expectations and experiences of hospital staff

Eric S. Kirkendall^{a,b,c,*}, Linda M. Goldenhar^c, Jodi L. Simon^c,
Derek S. Wheeler^d, S. Andrew Spooner^{a,b}

^a Division of Hospital Medicine, Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA

^b Division of Biomedical Informatics, Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA

^c James M. Anderson Center for Health Systems Excellence, Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA

^d Division of Critical Care Medicine, Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA

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ABSTRACT

Objectives: To examine healthcare worker's perceptions, expectations, and experiences regarding how work processes, patient-related safety, and care were affected when a quaternary care center transitioned from one computerized provider order entry (CPOE) system to a full electronic health record (EHR).

Methods: The I-SEE survey was administered prior to and 1-year after transition in systems. The construct validity and reliability of the survey was assessed within the current population and also compared to previously published results. Pre- and 1-year post-implementation scale means were compared within and across time periods.

Results: The majority of respondents were nurses and personnel working in the acute care setting. Because a confirmatory factor analysis indicated a lack of fit of our data to the I-SEE survey's 5-factor structure, we conducted an exploratory factor analysis that resulted in a 7-factor structure which showed better reliability and validity. Mean scores for each factor indicated that attitudes and expectations were mostly positive and score trends over time were positive or neutral. Nurses generally had less positive attitudes about the transition than non-nursing respondents, although the difference diminished after implementation. **Conclusions:** Findings demonstrate that the majority of responding staff were generally positive about transitioning from CPOE system to a full electronic health record (EHR) and understood the goals of doing so, with overall improved ratings over time. In addition, the I-SEE survey, when modified based on our population, was useful for assessing patient care and safety related expectations and experiences during the transition from one CPOE system to an EHR.

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* Corresponding author at: Division of Hospital Medicine, Cincinnati Children's Hospital Medical Center, 3333 Burnet Avenue ML-9009, Cincinnati, OH 45229, USA. Tel.: +1 513 636 1260; fax: +1 513 636 7247.

E-mail addresses: eric.kirkendall@cchmc.org, cincymed@gmail.com (E.S. Kirkendall).

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1. Introduction

Over the past 20 years, research findings have accelerated our knowledge of how healthcare providers think about adopting and using information technology in healthcare [1–5]. Numerous studies have described nurse and physician attitudes, perceptions, expectations, and experiences around implementing new clinical information systems. While most early studies focused on physicians, nurses have also reported favorable attitudes in the last 20 years [1,6]. Studies conducted as early as the 1970s showed that both groups express positive attitudes and expectations related to health information technology (HIT) [7,8]. In more recent studies, most care providers said they believed technology could improve healthcare and healthcare delivery, including patient safety [1,9,10]. A recent study found 93% of physicians agreed or strongly agreed that using computers in clinical care helps improve healthcare quality [10]. Overall, factors shown to positively influence successful EHR implementation include training and support, mitigating unintended consequences, minimizing adverse effects on time and efficiency, and managing or limiting the gap between expectations and perception of outcomes [11–15].

While surveys have shown that healthcare providers are overall optimistic toward EHRs, they are still concerned with privacy and security, workflow changes, distraction from direct patient care, and other unintended consequences of using an EHR system [9,16–23], which has been shown can result in lower stakeholder “buy-in” leading to potential rejection of the system [12,15,24]. Indeed, “buy-in” and user attitudes may prove to be a more critical variable for successful implementation and adoption than budget, technology, or sophistication of the vendor [25]. While general attitudes toward EHRs remain positive, attitudes about routine use are often negative [26]. A recent study has indicated that attitudes and the perceived usefulness of computer technology have shifted over time [6]. Recent changes in the healthcare and technology landscape including adoption driven by the Meaningful Use incentives may cause user attitudes and acceptance of IT implementation projects to vary from past reports [27].

Most current studies examining the transition from one HIT system to another have targeted the ambulatory setting [28–30]. Only one example was found that examined transition from one electronic order entry system to a full EHR in the inpatient setting which showed wide variation in expectations and experiences for both physicians and nurses [31]. The overall aim of our study was to administer a previously validated nursing survey to a wide population of health providers in the inpatient setting in order to better understand their perceptions of how changing from one CPOE system to a full EHR would affect them personally and their ability to safely care for patients.

2. Methods

2.1. Setting

This study was conducted at Cincinnati Children’s Hospital Medical Center (CCHMC), a 523-bed tertiary care academic

medical center. CCHMC is a level 1 trauma center which, in 2010, had 1,078,798 patient encounters, 1498 active medical staff, and 936 faculty members. In late 2008, implementation of the new EHR system (Epic Systems™; Verona, WI) began in several ambulatory pilot groups. Additional outpatient divisions were systematically brought on-line until all units were live by January 2012. The inpatient implementation go-live date was January 10th, 2010. Prior to implementation, inpatient care providers were using electronic order entry through a proprietary vendor product with a highly customized user interface. Most patient care documentation was done on paper, although some aspects of nursing care were documented electronically to facilitate research studies and quality improvement activities. Physicians did not document electronically prior to implementation. All order entry and documentation has been performed electronically since the new EHR was implemented.

2.2. Human subjects protection

This study was deemed exempt by the IRB since no patient data were used and survey responses were anonymous.

2.3. Data collection

We administered the Information Systems Expectations and Experiences (I-SEE) survey developed by Wakefield and colleagues to evaluate the hospital staff’s expectations prior to implementation and the change in perceptions after the EHR transition [32]. The I-SEE was selected because of its strong psychometric properties and direct relevance to our project in terms of measuring perceived changes in work-process and patient care/quality resulting from EHR implementation. Using the I-SEE in a larger and more diverse audience allowed us to further explore and establish the instrument’s reliability and external validity. Original survey materials are available on the Agency for Healthcare Research and Quality’s Health IT Toolkit website (<http://healthit.ahrq.gov>); the CCHMC version is available as an online supplement. The I-SEE contains 35 questions/items distributed across 7 scales:

- Provider–patient communication (3 items)
- Inter-provider communication (3 items)
- Inter-organizational communication (2 items)
- Work life changes (4 items)
- Improved care (7 items)
- Support and resources (8 items)
- Patient care processes (8 items)

The first five scales use a 7-point response scale ranging from much worse (–3), to no change (0), to much improved (+3) and measure perceptions of how the new clinical information system would (or did) impact various work processes in the hospital. The last two scales use a non-neutral 6-point agree/disagree Likert response scale (from Strongly Disagree (+1) to Strongly Agree (+6)) to measure perceptions of the information system’s implementation strategy and quality. We maintained the same response scales as the I-SEE and except for modifying the question tense, items were identically phrased for both pre and post implementation

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