

Chapter 10

Development and Psychometric Qualities of the SEIPS Survey to Evaluate CPOE/EHR Implementation in ICUs

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ABSTRACT

Health Information Technology (IT) implementation can fail or meet high levels of user resistance for a variety of reasons, including lack of attention to users' needs and the significant workflow changes induced and required by the technology. End-user satisfaction is a critical factor in health IT implementation. In this paper, the authors describe the process of developing and testing a questionnaire to evaluate health IT implementation, in particular Computerized Provider Order Entry (CPOE) and Electronic Health Record (EHR) technologies. Results show evidence for the validity and reliability of the questionnaire. The Systems Engineering Initiative for Patient Safety (SEIPS) questionnaire is easy to administer and allows researchers to evaluate different aspects of health IT implementation. Results of this research can be used for benchmarking results of future studies evaluating health IT implementation.

INTRODUCTION

One of the important applications of information technology (IT) to health care is Electronic Health Record (EHR), which includes the functionalities of computerized provider order entry (CPOE) and

electronic medication administration (eMAR) (Lee, Teich, Spurr, & Bates, 1996; Sittig & Stead, 1994; Tierney, Miller, Overhage, & McDonald, 1993). In CPOE, physicians and other providers enter orders directly into the computer instead of using a paper-based system. Through rapid information retrieval and efficient data management, CPOE systems have the potential to improve

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quality of patient care (Bates, et al., 1998; Bates, et al., 1999; Murff & Kannry, 2001; Overhage, Tierney, Zhou, & McDonald, 1997; Teich, et al., 2000). For reviews of the effects of CPOE on medication safety and quality of care, see Kaushal et al. (2003) and Kuperman et al. (2007). There are four specific areas in which CPOE can deliver specific advantages over traditional paper-based systems: process improvement, resource utilization, clinical decision support and guideline implementation (Kuperman, et al., 2007; Murff & Kannry, 2001; Sittig & Stead, 1994). According to some experts (Bates, Kuperman, & Teich, 1994; Lee, et al., 1996), a major advantage of CPOE and other EHR functionalities such as eMAR is the opportunity to receive online support information at the point of care. Despite the benefits of EHR (Kaushal et al., 2003), many attempts to implement such systems have failed or met with high levels of user resistance (Bates, 2006; Bates, et al., 1994; Connolly, 2005; Lee et al., 1996; Massaro, 1993a, 1993b; Sittig & Stead, 1994).

EHR implementation efforts have stumbled for a variety of reasons, including lack of sensitivity to users' needs and the significant changes induced and required by the technology (Massaro, 1993a, 1993b). Only a relatively small percentage of hospitals use EHR. Results of a survey in 2002 (Ash, Gorman, Seshadri, & Hersh, 2004) showed that CPOE was not available to physicians in 84% of the hospitals; completely available in 10% of the hospitals and partially available in 6%. More recent estimates suggest that EHR usage is increasing, but most hospitals are still in the planning stage (Delbanco, 2006; Jha, et al., 2009).

As part of a large study funded by AHRQ (http://cqpi.engr.wisc.edu/cpoe_home), we are evaluating EHR implementation in several intensive care units (ICUs) of a large hospital using a variety of methods, including observational methods, interviews with key personnel, focus groups, a survey questionnaire, assessment of medication errors and adverse drug events, and various quality of care indicators. In this paper we

focus on the survey questionnaire. The EHR being evaluated include various functionalities: CPOE, eMAR, physician and nursing documentation, and nursing flowsheets.

When conducting a survey, it is important to use valid and reliable questionnaires, an observation which may be considered all too obvious. A questionnaire needs to meet scientific criteria, as explained by Shortell et al. (1991): "Among the most important criteria of useful measures is that they be theory-based, reliable, valid, relevant to unit of analysis, and relatively easy to administer". However, questionnaires used in health care research are not always reliable or valid. For example, in a study on patient satisfaction with health care, Sitzia (1999) evaluated 195 studies and found that in 80% of the studies a new satisfaction assessment instrument was developed. Sixty percent of the studies in which a new instrument was developed did not report any data on validity or reliability of the instrument. Only 6% of the studies used instruments that were tested and met the minimum requirements with regard to reliability and validity. Results of a study examining validity and reliability of instruments measuring nurse-physician collaboration showed that only five questionnaires in 225 studies met the inclusion criteria used by the researchers (Dougherty & Larson, 2005).

In summary, research in health care can benefit by using valid and reliable instruments. In this paper we describe the process of developing a questionnaire to evaluate the implementation of health Information Technology (IT) from a human factors perspective.

BACKGROUND: HUMAN FACTORS AND TECHNOLOGY IMPLEMENTATION IN HEALTH CARE

The manner in which a new technology is implemented is as critical to its success as its technological capabilities (Eason, 1982; Smith & Carayon,

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