

Safer electronic health records: Using the science of informatics to develop safety assessment guides

Dean F. Sittig¹, PhD, Joan S. Ash², PhD, Adam Wright³, PhD, Hardeep Singh⁴, MD, MPH

¹The University of Texas Health Science Center, Houston, TX

²Oregon Health & Science University, Portland, OR

³Brigham and Women's Hospital, Boston, MA

⁴Michael E. DeBakey Veterans Affairs Medical Center, Houston, TX

Abstract

Following the IOM report, "Health IT and Patient Safety: Building Safer Systems for Better Care," the Office of the National Coordinator for Health Information Technology sponsored a project to address safety concerns in electronic health record-enabled (EHR) healthcare systems. To address the complexity of EHR-related errors and the difficulty in eliminating them, we designed the SAFER project (Safety Assurance Factors for EHR Resilience) to proactively identify potential safety issues and best practices for addressing them. We take into account the full sociotechnical context of EHR implementation and use. Our iterative work is grounded in several recently developed informatics-based scientific methods including:

- 1) Review of scientific clinical informatics literature*
- 2) Use of Rapid Assessment Process mixed-methods approaches developed for evaluating EHR-enabled healthcare systems in context*
- 3) A semantic wiki for asynchronous collaboration*
- 4) An 8-dimension socio-technical model of safe and effective EHR use*

We are developing and piloting self-assessment "checklist-type" tools using a unique mix of methods based on the science of biomedical informatics. As the country continues its rapid EHR deployment, we believe that these tools are essential to ensure that the safety of the "EHR-enabled healthcare system" continues to improve.

Description and outline of the proposed presentation

During this session, we will describe how the "SAFER: Safety Assurance Factors for EHR Resilience" project is using a multifaceted approach to facilitate the process of developing EHR safety self-assessment tools. Briefly, we will describe:

- 1) The 8-dimension socio-technical model that provides the theoretical framework for our EHR assessment tools [1], (HS or DS)
This 8-dimensional model is specifically designed to address the socio-technical challenges involved in design, development, implementation, use, and evaluation of EHRs within complex adaptive healthcare systems. The 8 dimensions are not independent, sequential, or hierarchical, but rather are interdependent and interrelated concepts similar to compositions of other complex adaptive systems. The dimensions are:
 - a. *Hardware and software* computing infrastructure, including equipment and software used to power, support, and operate clinical applications and devices
 - b. *Clinical content*, the textual or numeric data and images that constitute the "language" of clinical applications
 - c. *Human computer interface*, involving all aspects of the computer that users can see, touch, or hear as they interact with it
 - d. *People*, including everyone who interacts in some way with the system, from developer to end-user, plus potential patient-users
 - e. *Workflow and communication*, the processes or steps involved in assuring that patient care tasks are carried out effectively

- f. *Internal organizational features* (e.g., policies, procedures, environment and culture) which provide the internal socio-political and physical context that surround the EHR implementation
 - g. *External rules and regulations*, which may facilitate or constrain many aspects of the preceding dimensions, and
 - h. *Measurement and monitoring*, the process of measuring and evaluating both intended and unintended consequences of HIT implementation and use.
- 2) Our Rapid Assessment Process fieldwork facilitated develop of these tools [2],.(JA) Critical elements of the method include:
 - a. Developing a fieldwork guide which includes interview guides, observation field note templates, and other documents used during site visits
 - b. Carefully selecting observation sites and participants using a purposive selection process
 - c. Thoroughly preparing for site visits so that a short period of time in the field can produce optimal qualitative data
 - d. Partnering with local collaborators who can contribute local knowledge and also benefit from feedback offered by the research team
 - e. Collecting robust data to inform tool development by using multiple researchers and methods, and
 - f. Analyzing and reporting data in a structured manner helpful to the organizations being evaluated.
- 3) How we use the SaferEHR.org semantic wiki to develop and document our findings, (AW)
 - a. Overview of semantic wiki technology
 - b. Why semantic wiki was chosen
 - c. Development of metadata model
 - d. Experience with the semantic wiki
 - e. How this strategy assisted rapid development of tools.
- 4) Examples of the EHR assessment tools we have developed, (HS or DS)
 - a. Inpatient computerized provider order entry (CPOE)
 - b. Ambulatory ordering process for medications, e.g. e-Prescribing
 - c. System customization/configuration and upgrades
 - d. System – system interfaces, e.g., between CPOE and pharmacy, e-Prescribing and community pharmacy or Surescripts, ambulatory EHR and external clinical laboratory and inpatient to ambulatory physician practice EHRs.
 - e. Patient ID processes
 - f. Clinical decision support
 - g. Communication between providers (e.g. between hospital and ambulatory physician for hospital discharge)
 - h. Laboratory results review processes
 - i. Downtime events
 - j. Workforce issues involving essential roles and skills needed for safety assurance
- 5) The results of our pilot field testing of these tools. (HS or DS)
 - a. Methods for pilot testing tools in the field
 - b. Results of the pilot tests

Specific Educational Goals

Users will be able to:

- 1) Describe the 8 dimensions of the socio-technical model of safe and effective EHR use
- 2) Explain how semantic wiki technology was used to develop an asynchronous, collaborative web site that facilitated tool development
- 3) Evaluate the safety and effectiveness of their EHR implementation

- 4) Evaluate the utility of using the EHR assessment tools within their organizations

Who should attend?

The session is designed for healthcare practitioners and informaticians working in EHR-enabled healthcare settings who are interested in evaluating the safety and effectiveness of their EHR implementation.

References

1. Sittig DF, Singh H. A New Socio-technical Model for Studying Health Information Technology in Complex Adaptive Healthcare Systems. *Quality & Safety in Healthcare*, 2010 Oct;19 Suppl 3:i68-74. doi:10.1136/qshc.2010.042085. PMID: 20959322
2. McMullen CK, Ash JS, Sittig DF, Bunce A, Guappone K, Dykstra R, Carpenter J, Richardson J, Wright A. Rapid Assessment of Clinical Information Systems in the Healthcare Setting. An Efficient Method for Time-pressed Evaluation. *Methods Inf Med*. 2010 Dec 20;50(2). PMID: 21170469