

Guidelines for Improving Usability: *Proposed EHR Usability Evaluation Protocol (EUP)*

**Lana Lowry,
NIST Project Lead**



llowry@nist.gov

Our Team

▶ Proposed EHR Usability Evaluation Protocol

- Lana Lowry, Ph.D., NIST
- Robert Schumacher, Ph.D., Managing Director, User Centric
- Bob North, Ph.D., Chief Scientist, Human Centered Strategies, LLC

▶ Usability Safety Framework

- Chris Gibbons, M.D., M.P.H., Assistant Professor & Associate Director, Johns Hopkins Urban Health Institute
- Emily S. Patterson, Ph.D., Assistant Professor at the Ohio State University in the College of Medicine, School of Allied Medical Professionals, in the Health Information Management and Systems Division
- Patricia Abbott, Ph.D., R.N., B.C., F.A.C.M.I., F.A.A.N., Associate Professor, Johns Hopkins Center for Global Health

Our Agenda

- ▶ *“Guidelines for Improving Usability: Proposed EHR Usability Evaluation Protocol”*
Lana Lowry, Ph.D., NIST and
Robert Schumacher, Ph.D., Managing Director, User Centric
- ▶ *“The Relationship between Health IT Usability and Patient Safety: Towards an EHR Usability Safety Framework”*
Chris Gibbons, M.D., M.P.H., Assistant Professor & Associate Director, Johns Hopkins, Urban Health Institute, and
Emily S. Patterson, Ph.D., Ohio State University
- ▶ *“Government Best Practices in System Usability: A Brief History and Status of Human Factors Best Practices”*
Bob North, Ph.D., Chief Scientist, Human Centered Strategies, LLC

Our Objectives for This Session

▶ Our Objectives & Future

- Apply HCI methodology in the technical evaluation of EHR Usability
- Discuss the proposed application of the HCI methodology
- Gain constructive technical feedback on this proposed protocol
- Capture proposed modifications and other feedback
- Resulting in guidance for formal summative usability testing using EUP

Science

“Science is rooted in the will to truth. With the will to truth it stands or falls. Lower the standard even slightly and science becomes diseased at the core.”

*Max Wertheimer, On Truth, Social Research, Vol. 1, No. 2,
May, 1934.*

Methodology Rooted in Human Factors Science

- ▶ Concerned with addressing the ‘truth’ or facts through the application of human factors principles, knowledge, and techniques (system science)
- ▶ Agnostic with respect to the implementation of the methodology
- ▶ Builds on methods employed by myriad human factors evaluation programs, in and out of government
- ▶ Focus on critical (potentially related to patient safety) aspects of usability

EHR Usability Protocol (EUP)

- ▶ The EUP provides a methodology for identifying and eliminating risks to patients due to poor user interface design.
- ▶ This focus is the foundation of many existing, validated protocols for evaluating the usability of systems where safety is a critical component of user operation.
- ▶ EUP focuses on the most critical issues first.
- ▶ Other dimensions of usability are important.

Methodology Based on Best Practices

- ▶ Proposed application of existing Human-Computer-Interface (HCI) methodology for formal usability evaluation adapted from:
 - FDA Medical Device Technical Guidance
 - Other Best Practices in Human Factors Formal Evaluation
- ▶ Focus on Formal Evaluation – summative test with representative end users
- ▶ Ensure that users can complete critical tasks without errors that can cause potential harm

EHR Usability Protocol (EUP)

EUP major objectives:

- ▶ Elimination of “never events”
- ▶ Identification and mitigation of critical use errors
- ▶ Identification of areas for potential UI improvement and record user acceptance / satisfaction
- ▶ Report summative testing results in CIF (Common Industry Format)

http://www.nist.gov/customcf/get_pdf.cfm?pub_id=907312

Validation and Error Analysis

Following summative human factors testing procedures:

- ▶ Validation study engages a large sample of representative users doing representative tasks along with an error analysis
- ▶ Error analysis is a critical component because each use-related error must be explained and its remediation identified

Methodology Based on Best Practices

- ▶ *Formative Evaluation*—Systematic and iterative evaluation of the user interface and instructions for use through usability assessment methods such as expert reviews and usability testing, specifically focused on removal of use related problems and retesting of design modifications to address these problems.
- ▶ *Validation testing*—Formal usability tests conducted with representative users with production level user interfaces designed to identify any residual use related problems that would negatively affect patient safety or healthcare outcomes. This testing involves an analysis of any use related problems that were observed and a post-test identification of the root cause.

What the EUP is NOT

- ▶ Does not prescribe the ‘look and feel’ of the user interface; therefore,
- ▶ Does not stifle competition or creativity

Definition of Error

- ▶ An act of **commission** (doing something wrong) or omission (failing to do the right thing) that leads to an undesirable outcome or significant potential for such an outcome.
 - ▶ For instance, ordering a medication for a patient with a documented allergy to that medication would be an act of commission. Failing to prescribe a proven medication with major benefits for an eligible patient (e.g., low-dose unfractionated heparin as venous thromboembolism prophylaxis for a patient after hip replacement surgery) would represent an error of omission.
- ▶ Errors of **omission** are more difficult to recognize than errors of commission but likely represent a larger problem.
 - ▶ In other words, there are likely many more instances in which the provision of additional diagnostic, therapeutic, or preventive modalities would have improved care than there are instances in which the care provided quite literally should not have been provided.

Never Events

The proposed categories of never events are:

- ▶ **Wrong patient action of commission event:** Actions with potentially fatal consequences are performed for one patient that were intended for another patient because two patient identifiers were not displayed in an area of the screen that is visible without scrolling
- ▶ **Wrong patient action of omission event:** A patient is not informed of the need for treatment because the wrong patient's name was displayed on clinical data for another patient
- ▶ **Wrong medication event:** A patient receives the wrong medication, dose, or route because the displayed information was not accurate or required viewing information on hidden screens to be accurate
- ▶ **Delay in care event:** A patient should not receive a life-threatening delay in the provision of critical care activities due to design decisions made for administrative, billing, or security objectives
- ▶ **Unintended care event:** A patient should not receive unintended care actions due to actions taken to test software, train users, or demonstrate software to potential customers.

Additional Types of Errors

- ▶ **Sequence Error:** (A subclass of errors of commission) occurs when a person performs some task, or step in a task, out of sequence. E.g., A patient with fever may have blood culture followed by IV antibiotics. If antibiotics are given prior to the blood culture, the sensitivity of the blood culture decreases dramatically. If the EHR does not support user in the order of events, users may do it out of order and produce errors.
- ▶ **Timing Error:** A subclass of errors of commission) occurs when one fails to perform an action within an allotted time, either performing too fast or too slow. E.g., An arrhythmic patient is holter monitored. The test is uploaded to the EHR. Physician delays looking into the report as the EHR is not designed to alert the case of dangerous arrhythmias. The patient lands in the ICU because of delayed treatment.