Guidelines for Improving Usability: Proposed EHR Usability Evaluation Protocol

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Usability Evaluation Methods in Context

User Experience (UX) Methods

Do not involve users

- Expert evaluation
- KLM-GOMS
- Cognitive walkthrough

Involve users

- Card sorting
- Participatory design
- Eye tracking
- Ethnographic research
- Summative usability testing
- Formative usability testing
- Surveys
- Focus groups

Usability Evaluation Methods
UX Methods

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Usability Testing Process

Kickoff / Discovery

Preparation

Data Collection

Analysis / Reporting
Summative Usability Test Plan

- **Objectives**
  - Assess human performance on key tasks in terms of
    - Effectiveness (for all tasks)
    - Efficiency (for frequently used tasks)
    - Critical errors that impact patient safety
    - Satisfaction (for all tasks)

- **Methodology**
  - Describe participants for recruitment
    - User groups performing core tasks (physicians, nurses, staff)
  - Describe the outcomes to be measured and how, e.g.
    - Errors and failures
    - Completion time
    - Efficiency

- **Materials**
  - Describe the key use cases to be tested
  - Describe the EHR, the test platform, and the test data that will be used.

- **Procedure**
  - Describe how test sessions will be conducted, e.g.,
    - User training procedures
    - Summarize the main activities during each session.

- **Lab set up and test moderators**
  - Describe the testing environment.
  - Describe how the session will be recorded.
  - Roles of all involved
Some Key Differences for EHR Summative Tests

- Participants
  (N=15-20 *per* user group)
  - Clinical users conforming to personas/profiles outlined by vendor

- Training
  - EHR is not walk up and use

- Tasks *More*
  - High importance; tied to key tasks surrounding MU
  - High frequency
  - High criticality

- Application
  - Version tested

- Moderators *More*
  - Must have expertise and experience in human factors and clinical domains

- Data collected
  - Focus on increased focus on use errors affecting patient safety

- Reporting format
  - CIF: Common Industry Format: NIST IR 7742; enables comparisons across variety of performance measures
  - Focus on reporting errors and changes to reduce errors
Tasks and Scenarios are under Development

- Many tasks will be tied to Meaningful Use (MU) criteria
  - Many of the MU criteria have a significant human factors or usability component.

- Tasks will be developed in cooperation with clinical users and vendors so that they can be evaluated on both a clinical and usability level.

- Evaluating participants’ performances on tasks will form the basis of the usability evaluation of a given EHR.

Examples

- Order a blood test through a computerized interface
- E-prescribe a medication
- Record a patient’s demographic characteristics
- Review and update a problem list for a patient
- Review and edit a medication list, removing one medication and replacing it with another.
- Review and edit allergies list, add a newly discovered allergy. Discover that patient is allergic to an ingredient in one of the drugs in the list.
- Record vital signs; look at a history of patient’s morning heart rate.
- Record smoking status
Evaluators: Experience & Expertise

- **Education** Each test administrator should have an advanced degree in a human factors discipline (i.e., social and behavioral sciences)
  - Computer science, graphic arts, medical informatics, ‘short-course’ certificants, etc. are typically not sufficiently skilled

- **Experience** Each moderator should have a minimum of three years experience with EHRs and/or other health information technologies
Observing and Recording Use Errors

- **Use error** is a user behavior has a different result than intended by the manufacturer or expected by the operator. Examples of use error categories include those identified in the Usability Safety Framework:
  - Patient identification error
  - Data accuracy error
  - Visibility error
  - Consistency error
  - Recall error
  - Feedback error
  - Data integrity error
  - Mode error

- Tasks will be constructed to specifically test for these error conditions

- Both the quantity and quality of errors will be recorded

- The report will require an analysis of the errors (e.g., severity, and impact) as well as discussion/resolution on how the error will be mitigated
Protocol Development – Next Steps

- Finalize the adaptation of CIF processes to EHR testing
  - Test protocol examples (with tasks)
  - Data sheets
  - Etc.
- Development of the specific tasks
- Guidelines for engagement of clinical user groups
- Guidance for proper logistical test set up