Usability and Effects of EHR System Change on Perceived Workload

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Pilot Study: Effects of MU-EHR Implementation on Physician & Nurse Perceived Workload

Introduction

The Electronic Health Record Financial Incentives: Four years ago, the Center for Medicare and Medicaid Services enacted strong financial incentives for the adoption of Meaningful Use Electronic Health Records (MU-EHR) with the objective of improving care quality, safety, and efficiency.

The MU-EHR: A vendor-designed system based on workflow, efficiency, and clinician workload

Meaningful Use and Providers’ Tasks: Currently the “meaningful use” objectives of EHR are focused on physician tasks (e.g. order entry, drug alerts, electronic prescriptions), with less attention to nursing tasks and decision making.

Urgent & Convenient Care (UCC) Clinics:
• An increasingly popular model of care delivery
• More affordable than emergency care,
• Suited for urgent & acute, rather than emergency or chronic care

EHR and UCC Clinics: UCC clinics have a distinct workflow from both ER and primary care, bringing a unique set of concerns for patient safety and quality of care, as well as the design for appropriate EHR systems.

Results

To examine the effects of changing from a hybrid paper/electronic (H-EHR) to a Meaningful Use EHR (MU-EHR) on physician and nurse perceived workload in Urgent/Convenient Care Clinics, over time and whether the effects reflect perceived EHR usability, as suggested by models of technology acceptance (Holden & Karsh, 2010).

Aim

To evaluate the usability of the MU-EHR interface as it relates to physicians’ and nurses’ perceived changes in workload.

Methods

Design: Pre-Intervention (H-EHR) and Post- Intervention (MU-EHR)
• Post: 6 and 3 months post implementation of the MU-EHR
Setting: Two non-academic UCC clinics (Carle Convenient Care) in east-central Illinois
Participants: 17 physician staff and 27 nursing staff

Measures:
• Workload (NASA-TLX)
• Usability (System Usability Scale)
• Unstructured work observations, semi-structured interviews, time-motion, and surveys

Follow-up: Heuristic Evaluation of the MU-EHR

Introduction

Follow-up to Pilot Study: Results from the pilot study suggest that the current EHR tool is not optimally designed to support the additional work that physicians are now required to complete in order to meet “meaningful use” criteria.
• Rapid patient throughput and work “sharing” among nursing staff present opportunity for potential error
• Use of paper “scraps” to temporarily record patient information suggests inadequate EHR alignment with workflow and introduces potential data accuracy errors.
• Delays in information flow and missing information related to the patient visit may introduce error into documentation

Usability Evaluation: How well can users learn and use a product to achieve their goals? How satisfied are users?

The National Institute of Standards and Technology (NIST) has issued a document for the “Technical Evaluation, Testing, and Validation of the Usability of Electronic Health Records,” including a comprehensive checklist for “Expert Review of EHR,” which we condensed and adapted to fit Nielsen’s 10 Usability Heuristics.

Aim

To evaluate the usability of the MU-EHR interface as it relates to physicians’ and nurses’ perceived changes in workload.

Methods

Evaluators: An undergraduate (Psychology) and graduate student (IE), in collaboration with William Schuh (Carle CIO)
Setting: The EHR ambulatory training environment

Heuristic Evaluation of the MU-EHR interface, judging its compliance with the NIST’s and Nielsen’s usability principles.

Structured observation of typical UCC clinical tasks as performed by expert physician and expert nurse users of the system, with simple and complex versions. This allows us to create a cognitive task analysis for each task.

Target Tasks for Physician Expert Users
• Order cholesterol test
• Create clinical note (after patient visit)

Target Tasks for Nurse Expert Users
• Enter patient vitals
• Medication reconciliation

Heuristics for User Interface Design

Table 1. Nielsen’s Heuristic Descriptions and Examples from the NIST

<table>
<thead>
<tr>
<th>Heuristic</th>
<th>Description</th>
<th>Specified EHR Example</th>
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<tbody>
<tr>
<td>1. Visibility of system status</td>
<td>The system should always keep the user informed about what is going on, through appropriate feedback within reasonable time.</td>
<td>Does every display begin with a title or header that describes screen contents?</td>
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<td>2. Match between system &amp; the real world</td>
<td>The system should follow the user’s language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions.</td>
<td>Do the selected colors correspond to common expectations about color codes?</td>
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<td>3. User control &amp; freedom</td>
<td>Users often choose system functions by mistake and will need a clearly marked “emergency” exit to leave the unwanted state easily. Support undo and redo.</td>
<td>Can users cancel out of operations in progress?</td>
</tr>
<tr>
<td>4. Consistency and standards</td>
<td>The system should follow the user’s language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions.</td>
<td>Do the selected colors correspond to common expectations about color codes?</td>
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<tr>
<td>5. Error prevention</td>
<td>Error messages should be expressed clearly and explicitly, and avoid jargon.</td>
<td>Does every display begin with a title or header that describes screen contents?</td>
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<tr>
<td>6. Recognition rather than recall</td>
<td>The user should not have to explicitly remember information about actions or state.</td>
<td>Do the selected colors correspond to common expectations about color codes?</td>
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<td>7. Flexibility &amp; Efficiency of use</td>
<td>Users often choose system functions by mistake and will need a clearly marked “emergency” exit to leave the unwanted state easily. Support undo and redo.</td>
<td>Can users cancel out of operations in progress?</td>
</tr>
<tr>
<td>8. Aesthetic &amp; Minimalist design</td>
<td>Users often choose system functions by mistake and will need a clearly marked “emergency” exit to leave the unwanted state easily. Support undo and redo.</td>
<td>Can users cancel out of operations in progress?</td>
</tr>
<tr>
<td>9. Help users recognize, diagnose &amp; recover from errors</td>
<td>Error messages should be expressed clearly and explicitly, and avoid jargon.</td>
<td>Does every display begin with a title or header that describes screen contents?</td>
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<tr>
<td>10. Help &amp; documentation</td>
<td>Help messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.</td>
<td>Does every display begin with a title or header that describes screen contents?</td>
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