Selecting a Mobile App: Evaluating the Usability of Medical Applications

mHIMSS App Usability Work Group
August 7, 2012
Background

- Guidance on app usability for medical apps
- Practical, easy way for small to medium size practices to evaluate medical app usability
Purpose

• Develop a mobile app usability guide for the healthcare provider or IT staff engaged in the selection of mobile apps for his/her practice or hospital organization

• Outline basic steps in evaluating mobile app usability based on best practices
  – Leverage the HIMSS guide “Selecting an EHR for Your Practice: Evaluating Usability”, Aug 2010
Contributors

- Patricia Arellano, MS, Planned Systems International, Inc. (PSI)
- Janet Bochinski, MSN, PNP
- Beth Elias, PhD, MS, University of Alabama at Birmingham
- Shannon Houser, PhD, MPH, RHIA, University of Alabama at Birmingham
- Thomas Martin, MBA, mHIMSS
- Hank Head, McKesson
Medical app examples

- reference apps
  ~50% of medical app marketplace
- medical calculators
- clinical decision support
- apps designed to access electronic health records (EHRs) or personal health information (PHI)
Mobile app design

• The **data** is the focus. The interface should be simple and intuitive, with design elements not interfering with the data on a potentially small screen.

• The **layout** incorporates typographic elements that communicate meaning and are consistent across screens.

• **Feedback** can be provided directly to the design team.

• **Interactions** with the interface engage directly with the content and task at hand, keeping cognitive burden to a minimum.
**What is usability?**

<table>
<thead>
<tr>
<th>Usability Component</th>
<th>Example Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Efficiency</strong></td>
<td>Is it reasonable to take two minutes to use the app to compute drug dosing for a medication order?</td>
</tr>
<tr>
<td></td>
<td>How many steps should it take to view vital sign measurements of patients at home through apps that remotely connect to bedside monitors?</td>
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<tr>
<td></td>
<td>How long should it take for you to view medical images on a mobile platform?</td>
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<tr>
<td><strong>Effectiveness</strong></td>
<td>Is data entry too complex or confusing to perform completely and as intended?</td>
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<tr>
<td></td>
<td>Does the small screen size on your mobile device affect your ability to accurately interpret radiological images?</td>
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<tr>
<td></td>
<td>Is information poorly presented and subject to misinterpretation?</td>
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<tr>
<td><strong>User Satisfaction</strong></td>
<td>Does the app perform the way you expected?</td>
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<tr>
<td></td>
<td>Would you use the information/data obtained from the app in your clinical decision making process?</td>
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</tbody>
</table>
App Usability Principles

Simplicity

- Only information, visual elements, and functionality necessary to core tasks and decisions are included.
- Important information stands out, and function options are easy to understand. The focus is the data.
- The app has a clear, clean, uncluttered screen design.
App Usability Principles

Naturalness

- Screen metaphors are familiar to everyday life, or commonly expected computer experiences for the clinician.
- Workflows match the clinical practice needs.
- The app is intuitive and easy to learn; minimal, if any, training is required.
- Iconography and symbols speak “naturally.”
App Usability Principles

Consistency

- Graphic design and layout have the same look and feel, consistent placement of screen elements (e.g. gutters, columns, margins, and captions).
- Terminology and data entry fields are used consistently. Understanding how one screen works helps you understand how other screens work.
 Forgiveness and Feedback

- It's hard to lose data or destroy time-consuming effort with a wrong tap or wrong choice of buttons.
- If you make a mistake, the app helps you avoid it or provides a method to recover from errors gracefully (the system is “forgiving”).
- The app provides informative feedback about actions you are about to take or have taken.
- The app displays explanatory messages when processing information and describes how long it might take.
App Usability Principles

Effective Use of Language

- The app uses the same words that you use (while providing mapping to standardized codes and terms used for data retrieval).
- List or entry-form choices are clear and unambiguous.
- Sentences read like your native language (e.g. English).
App Usability Principles

Efficient Interactions

- The app minimizes the number of steps/gestures it takes to complete tasks; appropriate defaults are always provided.
- The app provides navigation options such as shortcuts for frequent and/or experienced users.
- Navigation methods minimize movements such as scrolling and switching between typing and tapping.
- Although input methods vary from OS to OS and even within devices, the design ensures that a usable method is present whether the desired input is through typing or the use of gestures. Gestures include single tap, multi-tap, swipe (where the method of input never leaves the screen tracing the letters to input) and auto complete.
App Usability Principles

Effective Information Presentation

- Information on screens includes sufficient white-space and large enough fonts to be read easily with high comprehension. No information is in all upper case.
- Colors are used to convey meaning (e.g. red to indicate medical urgency), not just for visual appeal.
App Usability Principles

Preservation of Context

- The app keeps screen changes and visual interruptions to a minimum during completion of a particular task. Visual interruptions include anything (e.g., dialog boxes) that force you to shift visual focus away from the area on the screen where you are currently reading and/or working to address something else, and then re-establish focus afterward. For example, dialog boxes should be kept to a minimum and should appear in-context (adjacent to or just below the control that triggered it).
App Usability Principles

Minimize Cognitive Overload

- Information needed for a particular task or decision is grouped together on a single screen rather than requiring you to mentally synthesize information from multiple screens.
- Alerts presented are clear, concise, and informative.
- The app performs calculations automatically so that you do not have to manually perform the calculations.
Practice Guide to Evaluating App Usability

- Consider Practice Goals and Measurable Objectives
- Check Other App's Usability and App Market Reviews
- Assess the app's usability with typical clinical scenarios
Consider Practice Goals and Measurable Objectives - Examples

• Improve the **efficiency** of prescription refill requests?
• **Effectively** use patient encounter data for patient education?
• **User satisfaction** with a clinical decision support tool?
• How much training will be required for clinicians to become adept with the app? (**ease of learning**)
## Other Resources to Supplement App Market Reviews

<table>
<thead>
<tr>
<th>Resource</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>iMedicalApps.com</td>
<td>Physician curated and generated reviews with indexed search functions by app type, physician specialty, and device platform.</td>
</tr>
<tr>
<td>iPhone Medical Apps: new, reviews, trends</td>
<td>Reviews focused on iPhone medical applications</td>
</tr>
<tr>
<td>Happtique</td>
<td>A mobile medical app store developed by healthcare professionals. Happtique currently developing a medical mobile app certification program to verify clinical appropriateness and technical functionality based on quality and performance standards.</td>
</tr>
<tr>
<td>KLAS</td>
<td>Reviews on “mobile data systems,” which KLAS describes as “products</td>
</tr>
<tr>
<td>mobihealthnews</td>
<td>News and reviews on the latest medical apps</td>
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</table>
Assess the app’s usability with typical clinical scenarios

- Create a representative set of clinical scenarios.
- Prepare a post-usability test questionnaire.
- Schedule your practice clinicians for a one-on-one hands-on test of the app after a brief demo.
- Conduct the usability test.
- Try to provide a test environment that closely simulates (or is) the actual usage environment and typical usage conditions.
- Observe and record observations, comments, times, errors.
- Incorporate the usability findings into your overall assessment of the app.
Example Clinical Scenarios

- Pediatric Medication Dose Calculation
- Review of Patient Test Results
- Diabetic Patient Education

Scenario 3: Diabetic Patient Education

A provider at a Diabetes Clinic is meeting with a patient to review their blood glucose measures and to help the patient meet their dietary and exercise goals. The provider has downloaded the patient's blood glucose measures for the last 2 weeks from EMR to the mobile device and is using an app that graphs the measures. Each measure that is above or below the target range is highlighted in red. Additional data such as meal times and exercise times can be added to the graph via a tap and drag menu of icons. When the provider taps on the highlighted measure, educational material is displayed that is appropriate to the measure. Additionally, the app can email this material to the patient at the patient's request. The trend graph can also be emailed. The trend graph can be resized to allow easier viewing at different levels of detail.

Task: Review patient blood glucose trending with patient

1. Identify and select patient.
2. Select date range for display of blood glucose measures.
3. Add meal and exercise times if desired.
4. Display educational material.
5. Email educational material and trend graph if desired.

Usability Principle

<table>
<thead>
<tr>
<th>Usability Principle</th>
<th>Example characteristics of a “usable” app</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simplicity</td>
<td>Unique patient identifiers are clearly displayed allowing for selection of the “right” patient.</td>
</tr>
<tr>
<td></td>
<td>Patient's demographic information such as gender and age are displayed prominently and in a location that makes it easy for you to reference.</td>
</tr>
<tr>
<td></td>
<td>You are able to quickly and efficiently specify the date range for display of the blood glucose measures.</td>
</tr>
<tr>
<td></td>
<td>Trend graph design is concise and uncluttered.</td>
</tr>
<tr>
<td></td>
<td>Menu of icons for meals and exercise allows for tap and drag to the trend graph and can be hidden.</td>
</tr>
<tr>
<td></td>
<td>Trend graph can be resized (made larger or smaller) easily to allow viewing at different levels of detail.</td>
</tr>
<tr>
<td></td>
<td>Trend graph is on a grid with time as the X axis and measures as Y, resizing...</td>
</tr>
</tbody>
</table>
Sample Post-Test Questionnaires

- System Usability Scale (SUS)
- Additional Sample Usability Post-Test Questions

<table>
<thead>
<tr>
<th>2. Additional Sample Usability Post-Test Questions</th>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The app had a clear, clean, uncluttered screen design.</td>
<td>○ ○ ○ ○ ○</td>
<td>○ ○ ○ ○ ○</td>
</tr>
<tr>
<td>2. The app kept screen changes to a minimum during completion of a task.</td>
<td>○ ○ ○ ○ ○</td>
<td>○ ○ ○ ○ ○</td>
</tr>
<tr>
<td>3. The app minimized the number of steps it took to complete tasks.</td>
<td>○ ○ ○ ○ ○</td>
<td>○ ○ ○ ○ ○</td>
</tr>
<tr>
<td>4. Information presented on screens was easy to comprehend quickly.</td>
<td>○ ○ ○ ○ ○</td>
<td>○ ○ ○ ○ ○</td>
</tr>
<tr>
<td>5. Information needed for a specific task was grouped together on a single screen.</td>
<td>○ ○ ○ ○ ○</td>
<td>○ ○ ○ ○ ○</td>
</tr>
<tr>
<td>6. Choice lists were clear and unambiguous.</td>
<td>○ ○ ○ ○ ○</td>
<td>○ ○ ○ ○ ○</td>
</tr>
<tr>
<td>7. Clinical documentation tools were efficient to use.</td>
<td>○ ○ ○ ○ ○</td>
<td>○ ○ ○ ○ ○</td>
</tr>
<tr>
<td>8. Alerts were only presented at appropriate times.</td>
<td>○ ○ ○ ○ ○</td>
<td>○ ○ ○ ○ ○</td>
</tr>
<tr>
<td>9. Data could be entered once then used in multiple places.</td>
<td>○ ○ ○ ○ ○</td>
<td>○ ○ ○ ○ ○</td>
</tr>
<tr>
<td>10. I felt confident I could make a mistake without losing my work.</td>
<td>○ ○ ○ ○ ○</td>
<td>○ ○ ○ ○ ○</td>
</tr>
</tbody>
</table>
Appendices

• Appendix A – Mobile Design Tenets
• Appendix B – Sample Usability Task Scenarios
• Appendix C – Sample Post-Test Questionnaires
  – System Usability Scale (SUS)
  – Additional App Usability Post-Test Questions
Next Steps

- Incorporate feedback from HIT Usability Task Force
- Post the guide on HIMSS HIT Usability and mHIMSS websites
- Track medical app usability certification initiatives
Questions, Comments, Suggestions?

- Patricia Arellano, parellano@plan-sys.com
- Janet Bochinski, jbochinski@dssinc.com
- Beth Elias, blelias@uab.edu
- Hank Head, hankh95@gmail.com
- Shannon Houser, shouser@uab.edu
- Tom Martin, tmartin@himss.org