Nurses’ Use of iPads for Clinical Documentation: A Usability Study

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Introduction

Methods

Results

Discussion

Implications

Summary

Penetration of Smartphone Ownership Globally in 2013

Overview

Mobile Devices: Potential Positive Clinical Impact

- Increase efficiency and patient safety
- Improve evidence-based practice
- Provide timely access to information
- Use of clinical decision support
- Freedom and mobility
- Improve productivity in practice
- Support clinical decision support

Usability is "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use." (International Organization for Standardization, 1998).

Usability goals:
1. Satisfaction
2. Efficiency
3. Errors
4. Learnability
5. Memorability

Mobile Devices: Usability Problems
- Navigation
  - Scrolling
  - Tapping on text or link
- Data Entry
  - Typing errors
  - Difficulty using stylus/handwritten letters
  - Highlighting text
- Screen Size
  - Screen display and font size too small

Bad Design Example

Usability Testing
- Observe end users in using the product
- Help researchers obtain quantifiable results and identify usability violations
- Can be used in different phases of product development
- Cost-effective way to gather end-user's input
- Can reveal up to 80-95% of errors
- Results help to redesign and improve the product
Purpose of Study

To examine how nurses use an iPad for clinical documentation in the acute care setting.

Setting

- Tertiary facility in Western Canada
- 47 Bed acute surgical unit
- Paper- and electronic-based clinical documentation
- Part of a larger study

Materials

- For Recording
  1. Laptop with webcam
  2. Morae™ software
- For Wi-Fi Connectivity
  1. Workstation-on-Wheel as proxy to connect to wireless network

- For Usability Testing/Clinical Documentation
  1. 2nd-generation iPad
  2. Bluetooth external keyboard
  3. Rounded tip stylus
Usability Testing Methods

• One participant per session
• Video-recording and audio-recording via webcam connected to laptop
• Use of Morae™ Recorder

Usability Testing Methods - Coding Scheme

• 4 categories of codes:
  1. Navigation (n=7 codes)
     - Two codes for extra taps
  2. Modifying Screen Size (n=3 codes)
  3. Data Entry (n=3 codes)
  4. Additional Codes (n=4 codes; e.g., login problems)

• Total of 17 codes

Example:

TASK: Tubes and Drain
Patient has a 14Fr Foley in situ, draining into a collection bag. You empty her urine for 120cc on arrival

TASK: Behaviour and Mood
Document her behaviour/mood: “Ms. Practice becomes very anxious about having a hysterectomy and her cancer diagnoses. Emotional support was provided and time spent to answer questions and provided education.”
Results

Sample: Age Group (n=9)

<table>
<thead>
<tr>
<th>Age Group</th>
<th>n=1</th>
<th>n=1</th>
<th>n=4</th>
<th>n=1</th>
<th>n=1</th>
<th>n=1</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31-40</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>41-50</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51-60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prefer not to say</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sample: Personal Computing Device Use

<table>
<thead>
<tr>
<th>Device</th>
<th>n=5</th>
<th>n=4</th>
<th>n=8</th>
<th>n=6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smartphone</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tablet (iPad)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Desktop</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laptop</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sample: Time on Task (min:sec)

<table>
<thead>
<tr>
<th>Task and Sequence</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Login</td>
<td>5:07</td>
<td>2:11</td>
<td>11:22</td>
</tr>
<tr>
<td>2. Vital Signs</td>
<td>3:10a</td>
<td>1:56</td>
<td>7:26a</td>
</tr>
<tr>
<td>4. Tubes/Drains</td>
<td>2:08</td>
<td>1:16</td>
<td>3:54</td>
</tr>
<tr>
<td>5. Behavior/Mood</td>
<td>3:08</td>
<td>1:47</td>
<td>5:07</td>
</tr>
<tr>
<td>6. Order Entry</td>
<td>5:10</td>
<td>1:16</td>
<td>8:34</td>
</tr>
</tbody>
</table>

*An outlier for vital signs task (15:49) was omitted above due to technical difficulties during task.*

| Median Time for Completion | 39:07 | 18:07 | 53:37 |
Percentage of User Behaviours (n=1148 codes)

<table>
<thead>
<tr>
<th>User Behaviour</th>
<th>Frequencies</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extra Taps - No response</td>
<td>553</td>
<td>48%</td>
</tr>
<tr>
<td>Mistaps</td>
<td>94</td>
<td>8%</td>
</tr>
<tr>
<td>Tapping finger</td>
<td>94</td>
<td>8%</td>
</tr>
<tr>
<td>Tapping stylus</td>
<td>81</td>
<td>7%</td>
</tr>
<tr>
<td>Tapping Right Click</td>
<td>44</td>
<td>4%</td>
</tr>
<tr>
<td>Scrolling problems</td>
<td>30</td>
<td>3%</td>
</tr>
<tr>
<td>Extra Taps - Processing/Loading</td>
<td>9</td>
<td>1%</td>
</tr>
<tr>
<td>Total</td>
<td>905</td>
<td>79%</td>
</tr>
</tbody>
</table>
Frequencies of Data Entry Behaviours

<table>
<thead>
<tr>
<th>User Behaviour</th>
<th>Freq</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-correction</td>
<td>22</td>
<td>2%</td>
</tr>
<tr>
<td>On-screen keyboard</td>
<td>61</td>
<td>1%</td>
</tr>
<tr>
<td>Keyboard shortcut</td>
<td>50</td>
<td>1%</td>
</tr>
<tr>
<td>Total</td>
<td>33</td>
<td>3%</td>
</tr>
</tbody>
</table>

- Different function for saving free-text documentation
- Self-correction related to use the system, not iPad interface

Discussion

Navigational Problems
- Windows platform is good for using mouse, not finger
- Switching between stylus and finger input was a source of frustration
- Scrolling on a touch-based device while running Windows
- “Fat Finger” Problem
  1. A large area of the user’s finger comes into contact with the touch screen
  2. The user’s finger occludes where the user is tapping exactly
Screen Size
- Desktop screen fitted onto the iPad
- Observations
  1. Loss of patient identifier on the screen when zoomed in
  2. Small font size, harder to read
  3. Nurses' posture leaning into the screen
- Changing the screen size and moving the screen around is disruptive to charting

Implications
- Usability testing is essential prior to implementation
- Need to test the clinical documentation system on a mobile device
- Mobile devices may benefit from drop-down menus rather than free-text entries
- Need robust organizational and technical support
- The user interface should be consistent across all devices (e.g., login, saving)
- Further research is required

Data Entry
- Small external keyboard
- Confusion when on-screen keyboard activated
- Different process for saving free-text entries

Summary
- Increase use of mobile devices in health care
- Need for usability testing of devices to determine fit with current software used, and clinical settings
- Testing revealed multiple usability problems in areas such as navigation, data entry, screen size, and login.
- Improvements are required before enterprise-wide implementation of mobile devices
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References