Team TerraMed
Computerized Physician Order Entry System (CPOE)
December 12, 2011

Team Members:
Andrew Higgins - ahiggins@umd.edu
Alisa Chen - alisa.ky.chen@gmail.com
Kevin Silver - kevinsilver12@gmail.com
Val Kravets - vkravets@terpmail.umd.edu
Kristian Sooklal - kristiansooklal@yahoo.com
What is the CPOE System?

**Purpose:** Physicians need a fast, accurate way of ordering tests and medications for patients.
- Life-critical system
- Typically one component of a hospital-wide EMR (Electronic Medical Record) system
- Replacement for person-to-person or written communication
- Provides more efficient and accurate communication
- Users are physicians and clerks
Current Systems

- **Paper Method**
- **Other CPOE Systems**
  - Integrated with entire hospital systems (integrated with other departments such as pharmacy, radiology, laboratory)
  - Stand-alone system
  - Some systems have fully integrated EMR (Electronic Medical Records)
- **The trend in the healthcare field is toward electronic CPOE systems**
Examples of CPOE Systems

KLM Analysis for CPOE lab order

Record CBC for PATIENT, CLINICAL F

<table>
<thead>
<tr>
<th>Task</th>
<th>Evaluator 1</th>
<th>Evaluator 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Record CBC (Complete Blood Count) for PATIENT, CLINICAL F</td>
<td>39</td>
<td>40</td>
</tr>
<tr>
<td>Retrieve CBC for PATIENT, CLINICAL F</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>Manage (Discontinue) CBC LB #125 for PATIENT, CLINICAL F</td>
<td>31</td>
<td>32</td>
</tr>
</tbody>
</table>

Partial Comparison for Total Use Cases

Total Time | 39 | 35.06 |
Examples of CPOE Systems (cont.)
Our Approach

- Simple, single page interface
- Easily searchable list of all tests
- Modeled after iTunes
- QuickFinder Panel
  - Saved Test Sets
  - Recently Used Tests
  - Commonly Used
Demo

http://terpconnect.umd.edu/~alisac/cmsc434/interface/login.html
Usability Testing Methodology

**Pre-Test Questionnaire:** Focus on getting background information on subjects.

**Task List:** Tests subjects ability to complete simple tasks for searching and ordering tests using manual and quick search methods.

**Post-Test Questionnaire:** Utilizes a Likert scale system to gauge users subjective satisfaction with the system based on several factors.
Results of Usability Testing

Performed usability testing on 10 subjects ranging from physician to clerks

Bar Graph demonstrates average satisfaction of users based on post-test questionnaire
Refining CPOE System

● Low Fidelity Prototyping
  ○ Three paper prototypes

● High Fidelity Prototyping
  ○ First tested by Dr. Hettinger
    ■ Consolidated screens
    ■ Rearranged selected and ordered tests panel
    ■ Eliminated extraneous columns
    ■ Changed position of buttons
    ■ Changed select/order terminology
Second Version of CPOE System

**Computerized Physician Order Entry**

<table>
<thead>
<tr>
<th>Patient Information</th>
<th>Quick Finder</th>
<th>Search Tests and Medications</th>
<th>Selected Tests and Medications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Picture</td>
<td>Set: Broken Leg</td>
<td>• X-ray&lt;br&gt;• Prescribe Morphine</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chest Pain</td>
<td>• CBC c diff&lt;br&gt;• Basic Metabolic Profile (BMP)&lt;br&gt;• Troponin (Trop)&lt;br&gt;• EKG&lt;br&gt;• X-ray (Chest - PA &amp; Lateral) (CXR-2-view)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>General</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Patient Info</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Allergies</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Room/Bed Info</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Patient Information**
- Andrew Higgins
- Male 20 yr 9 mo
- DOB: 12/15/1990
- PCP: Dr. Hettinger
- MD: University of Maryland
- 2505 D

**Quick Finder**
- Set: Broken Leg
  - X-ray
  - Prescribe Morphine
- Chest Pain
  - CBC c diff
  - Basic Metabolic Profile (BMP)
  - Troponin (Trop)
  - EKG
  - X-ray (Chest - PA & Lateral) (CXR-2-view)

**Search Tests and Medications**
- Basic Metabolic Profile
- Liver Function Tests
- Qualitative BHg
- Troponin
- Brain Natriuretic Peptide
- Arterial Blood Gas
- Venous Blood Gas
- Serum Sbg Test
- Left Femur X-ray
- Right Femur X-ray
- Blood Type
- Coagulation Panel
- Comprehensive Blood Count with Differential
- D-Dimer
- Type & Crossmatch
- Type & Screen
- Right Common Core

**Selected Tests and Medications**
- Basic Metabolic Profile
- Troponin
- Comprehensive Blood Count with Differential
- X-ray (requires region selection)
- EKG
Final Version of CPOE System
Refining CPOE System (cont.)

● High Fidelity Prototyping
  ○ Reviewed by Dr. Shneiderman and colleagues
  ○ Adjusted real estate allocation
    ■ Equalized column heights
    ■ Decreased font sizes
    ■ Adjusted colors

● Updates based on usability testing results
  ○ Improved consistency of layout
  ○ Adjusted colors
Future Work

- Implementing security for login and confirmation
- Implementing a "Select Patient" screen
- Integrating Hospital test and medication database
- Checking orders against patient allergies
- Setting up algorithm to list recently and frequently ordered tests
- Setting up direct manipulation interface for ordering imaging tests
Thank You

Dr. Ben Shneiderman, Tak Yeon Lee, Dr. Aaron Z. Hettinger, our usability test subjects, and CMSC434 colleagues

Any Questions....?