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
Kristian Sooklal - kristiansooklal@yahoo.com
Val Kravets - vkravets@terpmail.umd.edu
What is the CPOE System?

**Purpose:** Physicians need a fast, accurate way of ordering tests and medications for patients

- Typically one component of a hospital-wide EMR (Electronic Medical Record) system
- Replacement for person-to-person or written communication
- Provides faster and more accurate communication
- Users are physicians and clerks
- Life-critical system
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 have fully integrated EMR (Electronic Medical Records)
-The trend in the healthcare field is toward electronic CPOE systems
An Example of a CPOE System

KLM Analysis for CPOE lab order

Partial Comparison for Total Use Cases

<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>39</td>
<td>35.06</td>
</tr>
<tr>
<td>Manage (Discontinue) CBC LB #125 for PATIENT,CLINICAL F</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>20.04</td>
</tr>
<tr>
<td></td>
<td>31</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>32</td>
<td>34.6</td>
</tr>
</tbody>
</table>
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 pst-questionnaire
Refining CPOE System

Low Fidelity Prototyping
  three paper prototypes

High Fidelity Prototyping
  first tested by Dr. Hettinger
  rearranged selected and ordered tests
  moved buttons
  changed select/order terminology
### Computerized Physician Order Entry

#### Patient Information
- **Patient Picture**
- **Saved Test Sets**
  - Set: Broken Leg
    - X-ray
    - Prescribe Morphine
  - Chest Pain
    - CBC c diff
    - Basic Metabolic Profile (BMP)
    - Troponin (Top)
    - EKG
    - X-ray (Chest - PA & Lateral) (CXR-2-view)
- **General**
  - Name: Andrew Higgins
  - Age: 20 yr 9 mo
  - DOB: 12/15/1990
  - PCP: Dr. Hettinger
- **Allergies**
  - Pollen
  - Morphine
  - JQuery
- **Room/Bed Info**
  - 2503 D

#### Quick Finder

#### Search Tests and Medications

<table>
<thead>
<tr>
<th>Order</th>
<th>Test Name</th>
<th>Test Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select</td>
<td>Basic Metabolic Profile</td>
<td>Chemistry</td>
</tr>
<tr>
<td>Select</td>
<td>liver Function Tests</td>
<td>Chemistry</td>
</tr>
<tr>
<td>Select</td>
<td>Quantitative B12</td>
<td>Chemistry</td>
</tr>
<tr>
<td>Select</td>
<td>Troponin</td>
<td>Chemistry</td>
</tr>
<tr>
<td>Select</td>
<td>Brain Natriuretic Peptide</td>
<td>Chemistry</td>
</tr>
<tr>
<td>Select</td>
<td>Arterial Blood Gas</td>
<td>Chemistry</td>
</tr>
<tr>
<td>Select</td>
<td>Venous Blood Gas</td>
<td>Chemistry</td>
</tr>
<tr>
<td>Select</td>
<td>Serum IgG Test</td>
<td>Blood</td>
</tr>
<tr>
<td>Select</td>
<td>Left Femur X-ray</td>
<td>Femur</td>
</tr>
<tr>
<td>Select</td>
<td>Full Body C/T Scan</td>
<td>General Body</td>
</tr>
<tr>
<td>Select</td>
<td>Right Femur X-ray</td>
<td>Femur</td>
</tr>
<tr>
<td>Select</td>
<td>Blood Type</td>
<td>Blood</td>
</tr>
<tr>
<td>Select</td>
<td>Coagulation Panel</td>
<td>Blood</td>
</tr>
<tr>
<td>Select</td>
<td>Comprehensive Blood Count</td>
<td>Blood</td>
</tr>
<tr>
<td>Select</td>
<td>D-Dimer</td>
<td>Blood</td>
</tr>
<tr>
<td>Select</td>
<td>Type &amp; Crossmatch</td>
<td>Blood</td>
</tr>
<tr>
<td>Select</td>
<td>Type &amp; Screen</td>
<td>Blood</td>
</tr>
<tr>
<td>Select</td>
<td>Right-Capillary</td>
<td>Blood</td>
</tr>
</tbody>
</table>

**Showing 1 to 25 of 25 entries**

#### Selected Tests and Medications

<table>
<thead>
<tr>
<th>Remove?</th>
<th>Test Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remove</td>
<td>Basic Metabolic Profile</td>
</tr>
<tr>
<td>Remove</td>
<td>Troponin</td>
</tr>
<tr>
<td>Remove</td>
<td>Comprehensive Blood Count</td>
</tr>
<tr>
<td>Remove</td>
<td>X-ray (requires region selection)</td>
</tr>
<tr>
<td></td>
<td>EKG</td>
</tr>
</tbody>
</table>
Refining CPOE System (cont.)

High Fidelity Prototyping (cont.)
reviewed by Dr. Shneiderman and colleagues
adjusted real estate allocation
equalized column heights
decreased font sizes
adjusted colors
post usability testing
made layouts more consistent
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....?