

# MEDITECH

## **ARRA Meaningful Use Stage 3 Usability Study Usability Issues and Recommendations**

### **Acute 6.08**

**Medication Allergy List**

**Medication List**

**Drug-Drug, Drug-Allergy Interaction Checks**

**Electronic Prescribing**

**Computerized Provider Order Entry - Medications**

**Computerized Provider Order Entry - Laboratory**

**Computerized Provider Order Entry - Diagnostic Imaging**

**Clinical Information Reconciliation and Incorporation**

**Clinical Decision Support**

**Demographics**

**Problem List**

**Implantable Device List**

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## SUMMARY

From September 2016 to December 2016, we conducted a usability test of the Acute 6.08 MEDITECH platform, in accordance with National Institute of Standards and Technology (NIST) and Meaningful Use certification guidelines. In these tests, end users completed a variety of tasks throughout the system; these tasks were designed to assess how easily users could complete representative clinical workflows and to identify areas to improve the usability of our software.

To meet Meaningful Use requirements, we had to assess the usability of twelve features throughout the system:

- Medication Allergy List
- Medication List
- Drug-drug, Drug-allergy Interaction Checks
- Computerized Provider Order Entry - Medications
- Computerized Provider Order Entry - Laboratory
- Computerized Provider Order Entry - Diagnostic Imaging
- Electronic Prescribing
- Clinical Information Reconciliation and Incorporation
- Clinical Decision Support
- Demographics
- Problem List
- Implantable Device List

After conducting tests with end users to analyze the usability to each of those features, we analyzed each test to evaluate the usability of our software based on three metrics.

**This metric:**

**Analyzes:**

Effectiveness

Whether or not participants completed the task

Efficiency

The time required and steps taken to complete the task

User Satisfaction

Participant feedback on ease of use and areas for improvement

While gathering and analyzing testing sessions, we noted areas users struggled in the system, the cause of those struggles, and ways to improve the usability of those areas. From these observations, we crafted a list of usability issues and recommendations.

This document describes the usability study for Acute 6.08 MEDITECH.

## **TESTING PROCESS**

This section provides a brief outline of our testing process, including participant profiles, testing procedure, evaluative metrics, and issue identification.

### ***Participants***

We tested a total of 20 representative participants for this usability test. All of the participants are active users of the Acute 6.08 MEDITECH software representing clinical, administrative, and IT staff. Participants were asked to perform tasks for functions that most closely matched their daily workflow. On average, these participants had, at the time of testing, 8+ years of experience using the MEDITECH system.

### ***Testing Procedure***

Participants completed 30 tasks across the system to test multiple functionality points. We composed the tasks to mimic a representative clinical workflow, with different tasks spread across a patient visit. Here's an example task:

| Amanda has taken nitrofurantoin for her urinary tract infection, but has had dyspnea, cough, and chest and back pain since starting the medication. Discontinue this medication.

Each participant performed each task without assistance to the best of his or her ability, as quickly as possible, and with the fewest possible deviations. After each task, we asked the participant to rate the ease or difficulty of the task and gathered any participant feedback about the task.

### ***Test Environment***

Following is a summary of the participants' computing environment:

<b>Tested product:</b>	MEDITECH EHR, version 6.08
<b>Computer platforms:</b>	HP Probook with a 15" display
<b>Display:</b>	VA1926wSERIES display
<b>Screen resolution:</b>	1440 x 900 resolution
<b>Operating system:</b>	Windows 7

*Morae© software was used to assist with data collection.*

## ***Evaluative Metrics***

To analyze testing results, we captured seven primary pieces of data: task success, task errors, task deviations, task performance time, task time standard deviations, task rating, and System Usability Scale scores.

### **Task Success**

We counted a task as a success if the participant was able to achieve the correct outcome without assistance. We compiled the overall success rate for a task by dividing the number of task successes by the number of task attempts.

### **Task Errors**

While each participant worked through a task, we recorded his or her path to complete the task. We noted an error if the participant, for example, went to a wrong screen, clicked on an incorrect menu item, or followed an incorrect link *and* was not able to complete the task without returning to a previous step in the intended path.

### **Task Deviations**

While each participant worked through a task, we recorded his or her path to complete the task. We noted a deviation if the participant performed an unexpected or unnecessary action, navigated to an incorrect screen, or selected an incorrect item, but was able to continue towards completing the task.

### **Task Time**

We recorded the time from when a participant started a task to the time they finished it, expressed in seconds. Participants reported when they finished a task. We stopped task times when a participant failed to finish a task and continued task times when participants finished a task but failed to recognize they had completed it.

### **Task Time Standard Deviation**

We calculated the standard deviation of task performance times. The task time standard deviation captures the number of seconds that constitutes one standard deviation from the mean task performance time. For example, a standard deviation of 10 seconds indicates that one standard deviation from the mean task time is equal to the mean task time plus or minus 10 seconds.

### **Task Rating**

After each task, participants scored the ease or difficulty of the task on a scale of 1 (very difficult) to 5 (very easy). We computed the average rating for each task. In addition, during this process, we gathered participant feedback about the task—what they liked, disliked, thought could be improved, etc.

### **System Usability Scale (SUS)**

The SUS is an industry-standard, 10-item questionnaire that assesses the usability of the system under test. We administered the SUS to each participant following each testing session and compiled the overall SUS scores. During this process, we asked participants for their feedback on the entire system.

## ***Issue Identification***

After completing each testing session and compiling test data and observations, we identified areas where participants struggled in using the system. For example, if a task had a low task success rate and high task time, we analyzed the task to see if participants made common deviations to increase task time and prevent them from completing the task. If a task had low task ratings, we reviewed feedback to determine if participants had common complaints about the functionality in the task.

Conversely, we noted areas where the system performed well to determine what sort of workflows participants liked. We can use positive findings to help identify intuitive areas of the system and expand that functionality when possible to less intuitive functions.

For each issue, we calculated the number of participants who struggled with that issue, where the issue occurred in the participants' workflow, how the issue affected the outcome of the task, and whether or not the issue may affect patient safety. With that information, we assigned a priority to each issue, on a scale of 1 -3.

**Severity 1:** Severe usability issue that caused multiple or significant task failures or has room to improve patient safety.

**Severity 2:** Major usability issue that caused major struggles, or significantly slowed down users, or caused an isolated task failure.

**Severity 3:** Efficiency usability issue. Efficiency or workflow could be improved but the issue did not cause significant disruption.

In addition to identifying the details and priority of each issue, we composed a recommendation to each issue.



## **MEDICATION ALLERGY LIST**

### **Task Data**

The Medication Allergy List portion of the usability study was composed of three tasks. The following table outlines the mean effectiveness, efficiency, and user satisfaction data of these three tasks.

<b>Task</b>	<b>Effectiveness</b> (% Success)	<b>Efficiency</b>	<b>User Satisfaction</b> (Rating)
<b>Access Allergies</b>	<b>100%</b>	Time (sec): <b>17</b> Std Dev (sec): <b>6.7</b> Errors: <b>0</b> Deviations: <b>0</b>	<b>4.8/5.0</b>
<b>Change Allergy</b>	<b>100%</b>	Time (sec): <b>19</b> Std Dev (sec): <b>4.8</b> Errors: <b>0</b> Deviations: <b>0</b>	<b>4.0/5.0</b>
<b>Record Allergy</b>	<b>100%</b>	Time (sec): <b>89</b> Std Dev (sec): <b>61</b> Errors: <b>1</b> Deviations: <b>0</b>	<b>4.0/5.0</b>

### **Medication Allergy List Issues**

#### ***No issues***

#### **Findings**

Reviewing the Allergy List, editing an allergy, and adding a new allergy each performed very well in our testing. Each participant was able to complete each task within a reasonable time range and with minimal errors. In addition, participants scored their satisfaction with these tasks fairly high.

#### **Quotes**

"We do not document the allergy type at our organization."

"That was pretty straightforward. We do it every day."

## MEDICATION LIST

### Task Data

The Medication List portion of the usability study was composed of three tasks. The following table outlines the mean effectiveness, efficiency, and user satisfaction data of these three tasks.

<b>Task</b>	<b>Effectiveness</b> (% Success)	<b>Efficiency</b>	<b>User Satisfaction</b> (Rating)
<b>Access Medication</b>	<b>100%</b>	Time (sec): <b>17</b> Std Dev (sec): <b>3.4</b> Errors: <b>0</b> Deviations: <b>0</b>	<b>4.6/5.0</b>
<b>Change Medication</b>	<b>100%</b>	Time (sec): <b>48</b> Std Dev (sec): <b>11</b> Errors: <b>0</b> Deviations: <b>0</b>	<b>4.0/5.0</b>
<b>Record Medication</b>	<b>100%</b>	Time (sec): <b>113</b> Std Dev (sec): <b>59.5</b> Errors: <b>2</b> Deviations: <b>0</b>	<b>3.3/5.0</b>

### Medication List Issues

***Issue 1: Users attempt to click Home Medication header to access data***

#### **Issue Data**

Severity: **3**      Patient Safety: **No**      Number of users: **2**

#### **Findings**

Two participants attempted to access the reported medications data by clicking on the Home Medications table header, rather than clicking the 'Edit' button. Both users were able to recover and successfully complete the task by locating the 'Edit' button once they realized they were not successful by clicking the header.

#### **Quotes**

"I like the checkbox and ? box to let me know what is required."

#### **Recommendations**

Consider visual changes to make the 'Edit' button appear more pronounced on the screen, or consider launching home medications via the header.

## **DRUG-DRUG, DRUG-ALLERGY INTERACTION CHECKS**

### **Task Data**

The Drug-Drug, Drug-Allergy Interaction Checks portion of the usability study was composed of two tasks. The following table outlines the mean effectiveness, efficiency, and user satisfaction data of these two tasks.

<b>Task</b>	<b>Effectiveness</b> (% Success)	<b>Efficiency</b>	<b>User Satisfaction</b> (Rating)
<b>Adjustment of Severity Level for Drug-Drug Interaction Check</b>	<b>100%</b>	Time (sec): <b>48</b> Std Dev (sec): <b>14</b> Errors: <b>0</b> Deviations: <b>0</b>	<b>4.4/5.0</b>
<b>Drug-Allergy Interaction</b>	<b>100%</b>	Time (sec): <b>19</b> Std Dev (sec): <b>24</b> Errors: <b>0</b> Deviations: <b>0</b>	<b>4.2/5.0</b>

### **Drug-Drug, Drug-Allergy Interaction Checks Issues**

***Issue 1: Users would like more information on the interaction screen to provide a clear reason for why the interaction appears***

#### **Issue Data**

Severity: **2**      Patient Safety: **No**      Number of users: **4**

#### **Findings**

Four participants commented that they receive too many alert messages, which may lead to alert fatigue. The consensus was that participants wanted the alert to appear but wanted the presentation of information streamlined to make the reason of the alert more prominent on the screen.

#### **Quotes**

"There are too many alert messages."

"I don't care about food related alerts and these should not display."

"Clean up the alert screen to only focus on the alert trigger. Allow me to drill down deeper if I want to review more specific information."

#### **Recommendations**

Organizations are trained to manage the alerts that appear to help with alert fatigue. Review the presentation of information included on alert messages to ensure that users can quickly understand and respond to interaction alerts.

## ELECTRONIC PRESCRIBING

### Task Data

The Electronic Prescribing portion of the usability study was composed of two tasks. The following table outlines the mean effectiveness, efficiency, and user satisfaction data of these two tasks.

<b>Task</b>	<b>Effectiveness</b> (% Success)	<b>Efficiency</b>	<b>User Satisfaction</b> (Rating)
<b>Locating Rx Fill Status</b>	<b>70%</b>	Time (sec): <b>131</b> Std Dev (sec): <b>76</b> Errors: <b>10</b> Deviations: <b>1</b>	<b>3.0/5.0</b>
<b>Generate a Refill</b>	<b>70%</b>	Time (sec): <b>99</b> Std Dev (sec): <b>51</b> Errors: <b>7</b> Deviations: <b>0</b>	<b>3.0/5.0</b>

### Electronic Prescribing Issues

#### *Issue 1: Users cannot easily locate the Rx Fill Status*

##### **Issue Data**

Severity: **2**      Patient Safety: **No**      Number of users: **5**

##### **Findings**

Five participants had difficulty locating the Rx Fill Status. Two were able to recover and eventually locate it, but three were unable to successfully complete the task.

##### **Quotes**

"This is good information to have but too hard to find."

"I like how the system can display more details about the Rx transmission."

##### **Recommendations**

When pharmacies begin to utilize Rx Fill Status messages, evaluate any points in the workflow where the system could more prominently display Rx Fill Status.

## ***Issue 2: Users struggled to generate an ePrescribing refill order***

### **Issue Data**

Priority: **2**      Patient Safety: **No**      Number of users: **3**

### **Findings**

Three participants had difficulty initiating a refill order through electronic prescribing and were unable to successfully complete the task.

### **Quotes**

None

### **Recommendations**

Evaluate the process for generating a refill using ePrescribing to determine if the process can be enhanced. Also, ensure the online help and supporting documentation is sufficient to guide and instruct users on performing this function.

## COMPUTERIZED PROVIDER ORDER ENTRY

### Task Data

The Computerized Provider Order Entry (CPOE) portion of the usability study was composed of nine tasks. The following table outlines the mean effectiveness, efficiency, and user satisfaction data of these nine tasks.

<b>Task</b>	<b>Effectiveness</b> (% Success)	<b>Efficiency</b>	<b>User Satisfaction</b> (Rating)
<b>Record CPOE Medication</b>	<b>100%</b>	Time (sec): <b>92</b> Std Dev (sec): <b>39</b> Errors: <b>0</b> Deviations: <b>0</b>	<b>4.8/5.0</b>
<b>Change CPOE Medication</b>	<b>90%</b>	Time (sec): <b>109</b> Std Dev (sec): <b>96</b> Errors: <b>5</b> Deviations: <b>1</b>	<b>3.5/5.0</b>
<b>Access CPOE Medication</b>	<b>100%</b>	Time (sec): <b>34</b> Std Dev (sec): <b>6</b> Errors: <b>0</b> Deviations: <b>0</b>	<b>4.8/5.0</b>
<b>Record CPOE Laboratory</b>	<b>100%</b>	Time (sec): <b>52</b> Std Dev (sec): <b>23</b> Errors: <b>0</b> Deviations: <b>0</b>	<b>4.0/5.0</b>
<b>Change CPOE Laboratory</b>	<b>100%</b>	Time (sec): <b>49</b> Std Dev (sec): <b>34</b> Errors: <b>1</b> Deviations: <b>2</b>	<b>4.0/5.0</b>
<b>Access CPOE Laboratory</b>	<b>100%</b>	Time (sec): <b>28</b> Std Dev (sec): <b>7</b> Errors: <b>0</b> Deviations: <b>0</b>	<b>4.8/5.0</b>
<b>Record CPOE Diagnostic Imaging</b>	<b>100%</b>	Time (sec): <b>40</b> Std Dev (sec): <b>23</b> Errors: <b>0</b> Deviations: <b>0</b>	<b>3.0/5.0</b>
<b>Change CPOE Diagnostic Imaging</b>	<b>100%</b>	Time (sec): <b>81</b> Std Dev (sec): <b>50</b> Errors: <b>0</b> Deviations: <b>1</b>	<b>4.8/5.0</b>
<b>Access CPOE Diagnostic Imaging</b>	<b>100%</b>	Time (sec): <b>24</b> Std Dev (sec): <b>5</b> Errors: <b>0</b> Deviations: <b>0</b>	<b>4.6/5.0</b>

## **Computerized Provider Order Entry Issues - Medications/Laboratory/Diagnostic Imaging**

### ***Issue 1: Cannot edit orders from History tab***

#### **Issue Data**

Severity: **3**      Patient Safety: **No**      Number of users: **3**

#### **Findings**

Overall, CPOE for Medications/Laboratory/Diagnostic Imaging tested well, as evidenced by the high rate of task completion success for each task, as well as the high task rating scores. The primary issue was with editing existing orders. Three participants initially tried to edit orders by selecting the order from the History tab instead of the current orders tab. Once they realized they could not make the edit in that location, two of those three participants were able to successfully navigate from History to Current Order and successfully complete the task. The one remaining participant was unable to successfully complete the task.

#### **Quotes**

"I enter orders daily so this is easy."

#### **Recommendations**

Evaluate user workflows and expectations when editing orders. Consider options to make order data more interactive, to simplify the editing process.

### ***Issue 2: Users can only edit service date/time by clicking procedure name***

#### **Issue Data**

Severity: **3**      Patient Safety: **No**      Number of users: **4**

#### **Findings**

Currently, users cannot change the service date/time of existing orders by clicking on the date/time under the 'Start' column. Users must select the order by procedure name to initiate the edit.

Four participants expressed frustration with this process. They commented that it would be easier and more intuitive to be able to change the service date/time of existing orders by clicking directly on the previously entered service date/time.

#### **Quotes**

"Why do I have to click into this extra screen?"

## **Recommendations**

Current functionality allows for the selecting of orders to edit by clicking on the procedure name. Consider adding similar functionality by allowing users to edit orders by clicking on the existing service date/time.

### ***Issue 3: New Orders and New Meds tabs do not allow for ordering flexibility***

Severity: **3**      Patient Safety: **No**      Number of users: **2**

## **Findings**

Two participants made errors placing orders when either attempting to order a medication with the New Orders tab selected instead of New Meds, or vice versa. These participants expressed frustration with the system not automatically searching between both medications and orders when entering an order. This did not prevent the participants from entering the orders, but required extra time to switch tabs to enable the correct search.

## **Quotes**

"I always do this. Forget to switch between New Orders and New Meds."

## **Recommendations**

Evaluate ordering functionality to determine if it would be possible to have the system utilize one universal search option regardless of whether medication or procedures are being ordered.



## CLINICAL INFORMATION RECONCILIATION AND INCORPORATION

### Task Data

The Clinical Information Reconciliation and Incorporation portion of the usability study was composed of three tasks. The following table outlines the mean effectiveness, efficiency, and user satisfaction data of these three tasks.

Task	Effectiveness (% Success)	Efficiency	User Satisfaction (Rating)
Consume CCD - Allergies	73%	Time (sec): <b>193</b> Std Dev (sec): <b>161</b> Errors: <b>11</b> Deviations: <b>1</b>	<b>3.1/5.0</b>
Consume CCD - Problems	82%	Time (sec): <b>183</b> Std Dev (sec): <b>188</b> Errors: <b>2</b> Deviations: <b>0</b>	<b>4.4/5.0</b>
Consume CCD - Medications	82%	Time (sec): <b>247</b> Std Dev (sec): <b>159</b> Errors: <b>5</b> Deviations: <b>0</b>	<b>3.6/5.0</b>

### Clinical Information Reconciliation – Problems/Medications/Allergies

**Issue 1: Users are confused by how to access external data**

#### Issue Data

Severity: **3**      Patient Safety: **No**      Number of users: **4**

#### Findings

Four participants attempted to access external data by clicking on the 'External Data Available' text instead of by clicking the 'Edit' button. This resulted in frustration as users attempted to locate the information.

#### Quotes

None

#### Recommendations

Consider providing the ability to access external data by clicking on the 'External Data Available' text in addition to the 'Edit' button.

## ***Issue 2: Lack of consistency when reconciling external problems/medications/allergies***

### **Issue Data**

Severity: **1**      Patient Safety: **No**      Number of users: **7**

### **Evidence**

Seven participants commented that they are being asked to perform the same function in three different areas, and the screens are not consistent across each location.

### **Quotes**

"The screens for problems and medications appear to be the same, but allergies is totally different."

"Is there an option to select all like before?"

### **Recommended Solution**

Evaluate screen layout and design so that consistency is maintained across all three areas when external data is consumed.

## ***Issue 3: 'Add Selected External...' footer button location and meaning not intuitive***

### **Issue Data**

Severity: **1**      Patient Safety: **No**      Number of users: **5**

### **Evidence**

Five participants struggled to locate the 'Add Selected External...' footer button in order to properly reconcile external data.

### **Quotes**

"I didn't even see that button."

"Why did you put it in the bottom corner?"

"Now what? Something should tell me I am done and it is time to save."

### **Recommended Solution**

Evaluate screen layout and design to determine if the button is needed, and if it is, determine a way to make the button more integrated into the workflow.

#### ***Issue 4: System should automatically match data from CCD to data in patient record***

##### **Issue Data**

Priority: **1**      Patient Safety: **No**      Number of users: **4**

##### **Findings**

Four participants commented that the system should be able to match any data coming in on the CCD as long as it matches entries already in the system. There is too much manual data entry when the system could alleviate some of the work. For example, if any allergy (including severity and reaction) come in on a CCD and everything matches data entry values in the system, then the system should default all of that data onto the allergy, instead of requiring a user to match each value.

##### **Quotes**

"Why can't the system match some of the data as long as it is the same? Then I can just review."

##### **Recommendations**

Evaluate providing functionality to allow the system to match CCD data values with entries that exist in the system. If a match exists, then perform the reconcile and require the user to review the entry for accuracy before confirming the values.

#### ***Issue 5: Not intuitive where to find external medications***

##### **Issue Data**

Priority: **2**      Patient Safety: **No**      Number of users: **4**

##### **Findings**

Four participants had difficulty finding external medications to consume. They could locate the 'External Data Available' label, but struggled with going to the 'New' tab in order to view the External Data.

##### **Quotes**

"I eventually found it under 'New'."

##### **Recommendations**

Evaluate adding the 'External Data' tab to the header and not nest it under the existing 'New' tab. This would make it visually easier to locate and more closely match the display that exists for Allergies and Medications.

## CLINICAL DECISION SUPPORT

### Task Data

The Clinical Decision Support portion of the usability study was composed of eight tasks. The following table outlines the mean effectiveness, efficiency, and user satisfaction data of these eight tasks.

<b>Task</b>	<b>Effectiveness</b> (% Success)	<b>Efficiency</b>	<b>User Satisfaction</b> (Rating)
<b>Generate Problem List Interventions</b>	<b>100%</b>	Time (sec): <b>27</b> Std Dev (sec): <b>6</b> Errors: <b>0</b> Deviations: <b>0</b>	<b>4.4/5.0</b>
<b>Generate Medication List Interventions</b>	<b>100%</b>	Time (sec): <b>42</b> Std Dev (sec): <b>8</b> Errors: <b>0</b> Deviations: <b>0</b>	<b>4.4/5.0</b>
<b>Generate Medication Allergy Interventions</b>	<b>100%</b>	Time (sec): <b>29</b> Std Dev (sec): <b>5</b> Errors: <b>0</b> Deviations: <b>0</b>	<b>4.4/5.0</b>
<b>Generate Demographics Interventions</b>	<b>100%</b>	Time (sec): <b>34</b> Std Dev (sec): <b>6</b> Errors: <b>0</b> Deviations: <b>0</b>	<b>4.4/5.0</b>
<b>Generate LAB Test and Result Interventions</b>	<b>100%</b>	Time (sec): <b>28</b> Std Dev (sec): <b>7</b> Errors: <b>0</b> Deviations: <b>0</b>	<b>4.4/5.0</b>
<b>Generate Vital Signs Interventions</b>	<b>100%</b>	Time (sec): <b>21</b> Std Dev (sec): <b>4</b> Errors: <b>0</b> Deviations: <b>0</b>	<b>4.4/5.0</b>
<b>Identify User Diagnostic and Therapeutic Reference Information</b>	<b>18%</b>	Time (sec): <b>82</b> Std Dev (sec): <b>46</b> Errors: <b>6</b> Deviations: <b>0</b>	<b>3.8/5.0</b>
<b>Enable Clinical Decision Support Interventions</b>	<b>100%</b>	Time (sec): <b>62</b> Std Dev (sec): <b>11</b> Errors: <b>2</b> Deviations: <b>0</b>	<b>4.8/5.0</b>

## **Clinical Decision Support – Infobutton Issues**

***Issue 1: Users had trouble utilizing the right-click functionality to access InfoButton to search for more information about a medication***

### **Issue Data**

Severity: **2**      Patient Safety: **No**      Number of users: **8**

### **Findings**

Eight users failed to use the right-click functionality to locate the InfoButton in order to search for more information about a medication.

### **Quotes**

“I would use the globe icon to search for additional information.”

### **Recommendations**

This issue is likely due to lack of training. Right-clicking can be useful if users know that it is available. It's a matter of teaching users about right-clicking to alert them to the presence of this functionality.

## PROBLEM LIST

### Task Data

The Problem List portion of the usability study was composed of two tasks. The following table outlines the mean effectiveness, efficiency, and user satisfaction data of these two tasks.

<b>Task</b>	<b>Effectiveness</b> (% Success)	<b>Efficiency</b>	<b>User Satisfaction</b> (Rating)
<b>Access Active Problem List</b>	<b>100%</b>	Time (sec): <b>15</b> Std Dev (sec): <b>2</b> Errors: <b>0</b> Deviations: <b>0</b>	<b>5.0/5.0</b>
<b>Change Active Problem List</b>	<b>100%</b>	Time (sec): <b>100</b> Std Dev (sec): <b>70</b> Errors: <b>0</b> Deviations: <b>2</b>	<b>3.5/5.0</b>

### Problem List Issues

#### *Issue 1: Difficulty changing an existing problem*

##### **Issue Data**

Severity: **2**      Patient Safety: **No**      Number of users: **4**

##### **Findings**

Four participants had difficulty changing the status of an existing diabetes problem to uncontrolled. Some chose to edit the status while others opted to change the problem itself.

##### **Quotes**

None

##### **Recommendations**

Evaluate user workflows and preferences to determine the most intuitive way to edit an existing problem.

## DEMOGRAPHICS

### Task Data

The Demographics portion of the usability study was composed of four tasks. The following table outlines the mean effectiveness, efficiency, and user satisfaction data of these four tasks.

<b>Task</b>	<b>Effectiveness</b> (% Success)	<b>Efficiency</b>	<b>User Satisfaction</b> (Rating)
<b>Record Patient Demographics (Race, Ethnicity, Preferred Language, Sex, Sexual Orientation, Gender Identity, Date of Birth)</b>	<b>90%</b>	Time (sec): <b>170</b> Std Dev (sec): <b>161</b> Errors: <b>2</b> Deviations: <b>0</b>	<b>4.6/5.0</b>
<b>Access and Edit Patient Demographics (Race, Ethnicity, Preferred Language, Sex, Sexual Orientation, Gender Identity, Date of Birth)</b>	<b>100%</b>	Time (sec): <b>19</b> Std Dev (sec): <b>4</b> Errors: <b>0</b> Deviations: <b>0</b>	<b>4.6/5.0</b>
<b>Record Preliminary Cause of Death and Date of Death</b>	<b>90%</b>	Time (sec): <b>108</b> Std Dev (sec): <b>48</b> Errors: <b>2</b> Deviations: <b>0</b>	<b>4.6/5.0</b>
<b>Access and Change Preliminary Cause of Death and Date of Death</b>	<b>100%</b>	Time (sec): <b>14</b> Std Dev (sec): <b>2</b> Errors: <b>0</b> Deviations: <b>0</b>	<b>4.6/5.0</b>

### Demographics Issues

#### ***Issue 1: Provide standard responses for queries***

##### **Issue Data**

Severity: **3**      Patient Safety: **No**      Number of users: **2**

##### **Findings**

Two participants commented that there should be a standard set of responses for key demographic queries.

## **Quotes**

"Everyone should have the same standard responses (mnemonics) for race, ethnicity, etc."

"Sexual preference is not captured at registration. It is more of a nursing responsibility, their role would collect this information because it is so personal."

## **Recommendations**

Participants were informed that there are standard values associated with each demographic criterion and that group response queries can be built to include each of standard value responses.

## ***Issue 2: Enter/Edit and View Patient screens are not consistent***

### **Issue Data**

Severity: **2**      Patient Safety: **No**      Number of users: **2**

### **Findings**

The Enter/Edit and View Patient screen layouts are not consistent. All of the information is contained on both screens, but in a different layout. This difference caused some confusion for two participants.

## **Quotes**

"The view is not consistent with enter/edit in regards to the placement of these fields."

## **Recommendations**

Maintain consistency between screens and evaluate changes to the layout and field placement so that both screens appear in a similar manner.



## IMPLANTABLE DEVICE LIST

### Task Data

The Implantable Device List portion of the usability study was composed of two tasks. The following table outlines the mean effectiveness, efficiency, and user satisfaction data of these two tasks.

<b>Task</b>	<b>Effectiveness</b> (% Success)	<b>Efficiency</b>	<b>User Satisfaction</b> (Rating)
<b>Record Unique Device Identifiers Associated with Implantable Device</b>	<b>100%</b>	Time (sec): <b>123</b> Std Dev (sec): <b>83</b> Errors: <b>1</b> Deviations: <b>0</b>	<b>3.3/5.0</b>
<b>Change Status of Unique Device Identifier</b>	<b>100%</b>	Time (sec): <b>218</b> Std Dev (sec): <b>196</b> Errors: <b>5</b> Deviations: <b>0</b>	<b>4.5/5.0</b>

### Implantable Device List Issues

#### ***Issue 1: Confusion about Close button after entering new device***

##### **Issue Data**

Severity: **2**      Patient Safety: **No**      Number of users: **2**

##### **Findings**

Two participants expressed concern about the wording of the Close button after entering a new implantable device.

##### **Quotes**

"This makes new nervous that it says Close. If I click Close will I lose it? Should say return to screen or something similar."

"I like how bar code scanning will default all the information for the device."

"This should come from the OR system. No patient is going to know the exact date of their implant."

##### **Recommendations**

Evaluate the label of the Close button to determine if a clearer use of text could be applied to clarify exactly what will happen if a user selects this button.

## ***Issue 2: Explanted/Inactive tab confusing***

### **Issue Data**

Severity: **2**      Patient Safety: **No**      Number of users: **4**

### **Findings**

Four participants questioned the difference between Explanted and Inactive when viewing the implantable device tabs.

### **Quotes**

"I see there is a tab for Implanted, but why are Explanted and inactive grouped together?"

"To me these mean the same thing."

### **Recommendations**

Review the labels to determine if clearer text can be selected. Research the regulation and gather user input in this evaluation.

## **SYSTEM USABILITY SCALE (SUS) SCORE**

The System Usability Scale (SUS) analyses subjective user feedback to the system, on a numeric scale from 0 - 100. Generally, anything above 68 is considered usable. In this test, the SUS was 70.7, indicating that participants generally found the system to be acceptably usable.

<b>Overall SUS Score</b>
<b>70.7</b>

## **APPENDIX A: CLINICAL PARTICIPANT SCRIPT**

### ***Scenario One***

Harriet Thompson is a 67-year-old female who was recently admitted. Harriet has diabetes and chronic kidney disease.

Harriet has a winter residence in Arizona, and has been seeing a physician there over the last few months. Harriet has a CCD from that practice. You need to reconcile Harriet's medical information with her record at her other provider. You also want to gather additional clinical information to ensure that Harriet's chart is up to date.

**Task 1:** Reconcile the allergies on Harriet's CCD with those on her allergy list.

**Task 2:** Reconcile the problems on Harriet's CCD with those on her problem list.

**Task 3:** Reconcile the medications on Harriet's CCD with those on her medication list.

**Task 4:** Harriet reports that she has also started an aspirin regimen. Add this to her medication list as a home medication.

**Task 5:** Harriet also reports that she got a hip replacement while in Arizona. Record her Regenerex Hip System as an implantable device.

**Task 6:** Your organization has begun to capture gender identity and sexual orientation in social history. Update Harriet's PFSH to must record this information. Record Harriet's gender identity as female.

**Task 7:** Next, update her sexual orientation to homosexual.

### ***Scenario Two***

Now that you have reconciled external data and updated Harriet's clinical information, you begin your visit workflow.

**Task 8:** While updating Harriet's clinical information, you noticed that she has an outstanding order for a mammogram. Harriet indicates that she has not had a mammogram in over a year. Update the service date on the mammogram so that Harriet gets the mammogram in the next month.

**Task 9:** You also noticed Harriet has an outstanding HbA1c order. You decide to perform the procedure while she is admitted. Update the service date to today.

**Task 10:** After your nurse performed the HbA1c procedure, you continue your review while you await the results. Harriet had high blood pressure when admitted. You decide to prescribe a medication for her hypertension. Order nifedipine 10mg PO QD. If Nifedipine is contraindicated, do not place the order.

**Task 11:** Because Harriet has CKD and high blood pressure, you are concerned about renal artery stenosis. Order a Renal Arteriogram. If contraindicated, do not place the order.

**Task 12:** Because the MRA was contraindicated, you want to consider a different diagnostic procedure. Find more info about alternative diagnostics for a Renal Arteriogram to analyze renal artery stenosis.

**Task 13:** Based on the information you found, you decide to order a Pelvic Ultrasound. Place this order. If the order is contraindicated, do not place the order.

**Task 14:** Harriet has been complaining of minor headaches. Prescribe prescription-strength ibuprofen. If contraindicated, do not place the order.

**Task 15:** Submit your orders for Harriet.

**Task 16:** Update Harriet's problem list based on your observations from this visit. Update her diabetes diagnosis to uncontrolled.

**Task 17:** Add hypertension as problem.

### ***Scenario Three***

Your next patient is 26-year-old Amanda Sullivan. Amanda has a urinary tract infection for which she has received antibiotics, but she's still symptomatic. In addition, she's been having side effects from her antibiotic.

**Task 18:** Amanda has taken nitrofurantoin for her urinary tract infection, but has had dyspnea, cough, and chest and back pain since starting the medication. Discontinue this medication.

**Task 19:** You decide to order a urinalysis to determine if Amanda's UTI has been resolved. Order this test for today.

**Task 20:** Based on results from Amanda's urinalysis, you want to prescribe another antibiotic. Order trimethoprim/sulfamethoxazole. If contraindicated, do not place the order.

**Task 21:** Because Amanda is allergic to TMP/SMX, order fosfomycin. If contraindicated, do not place the order.

**Task 22:** Submit your orders for Amanda

**Task 23:** Update Amanda's allergies based on today's visit. Add nitrofurantoin to her allergies.

**Task 24:** Update the severity on her TMP/SMX allergy to severe.

**Task 25:** Amanda has asthma and has a refill ordered for her inhaler. She's curious if the pharmacy has filled her prescription. Check the fill status on the prescription.

**Task 26:** While admitted Amanda would also like to have her Stradis IUD removed. Record the Explant of the the Stradis IUD from her implantable device list.

### ***Scenario Four***

You have received a phone call from Ademaro Reynoso. He plans to come into your clinic for his first appointment next week.

**Task 27:** Create a new patient entry fro Ademaro Reynoso for Practice LSSMPMA GP and book a NEW PT VIS appointment for him.

He gives his address as 574 3rd Ave for Saint Paul, MN, 55103.

His birth date is 08/09/1982, he is male, he chooses not to give his Social Security, he is married, he says he is Hispanic or Latino for race, and his preferred language is Spanish.

His home phone is 651-555-7844.

The visit reason will be New Pt and book the appointment 7 days from now for 10:00 am.

### ***Scenario Five***

You have received a phone call from patient Helen Potter. She has decided to disclose some additional demographics to you.

**Task 28:** Access Helen Potter's account and update her demographics with the following:

Her preferred language is English.

Her race is White.

### ***Scenario Six***

A provider at your clinic, Dr. Mark Jones, is frustrated with receiving mild drug-drug interaction warnings.

**Task 29:** Edit the necessary settings for the MARKJONES entry in the MIS Interaction/Conflict Groups Dictionary to remove mild drug-drug interaction warnings.

### ***Scenario Seven***

Your organization has noted that pregnant women are not getting the recommended DTaP immunization in the third trimester of pregnancy. In the interest of increasing compliance with this recommendation, your organization plans to edit an existing pregnancy order set.

**Task 30:** Modify the 28 Week Pregnancy Visit order set in the AOM Ordre Set Dictionary to include a DTaP immunization procedure. Set the item to be checked as a default for the set.

## APPENDIX B: CLINICAL PARTICIPANT DEMOGRAPHICS

### Gender

Female	14	70 %
Male	6	30 %

### Age

Choose not to disclose	0	0%
Under 20	0	0%
20-29	2	10%
30-39	5	25%
40-49	5	25%
50-59	4	20%
60-69	4	20%
Over 70	0	0%

### What is the highest level of education you have completed?

Choose not to disclose	0	0%
No schooling	0	0%
8th grade or under	0	0%
High school graduate, or equivalent	2	10%
Trade/technical/vocational training	2	10%
Associate degree	2	10%
Bachelor's degree	5	25%
Master's degree	0	0%
Professional degree	0	0%

Doctorate degree	9	45%
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**What is your occupation/role? (Select all that apply)**

Registered Nurse	5
LPN	0
Nurse Practitioner	0
Physician	6
Resident	0
Administrative	3
IT Staff	6
Other	0

**How many years have you been working in your current profession?**

Less than 1 year	1	5%
1-3 years	3	15%
4-6 years	6	30%
7-9 years	1	5%
Over 10 years	9	45%

**How many hours per week do you spend on a computer?**

0-10	0	0%
11-25	1	5%
26+	19	95%

**How many years experience do you have with any EHR?**

Less than 1 year	1	5%
1-2 years	5	25%
3-5 years	0	0%



Over 5 years	14	70%
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