

EHR Usability Test Report

Report based on ISO/IEC 25062:2006 Common Industry Format for Usability Test Reports

Medical Concierge EMR v. 3.0

Dates of Usability Test: Nov 30, Dec 1, Dec 4, and Dec 5 of 2017

Location of Usability Test: Iowa Cancer Specialists, PC
1351 W. Central Park
Davenport, IA 52804

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Table of Contents

EXECUTIVE SUMMARY.....	4
INTRODUCTION.....	5
METHOD.....	5
PARTICIPANTS.....	5
STUDY DESIGN.....	5
TASKS.....	5
Task 1a: Record Demographics	6
Task 1b: Change & Display Demographics.....	6
Task 2a: Record Medication Order	6
Task 2b: Change Medication Order	6
Task 2c: Access Medication Order	6
Task 2d: Record Laboratory Order	6
Task 2e: Change Laboratory Order	6
Task 2f: Access Laboratory Order	6
Task 2g: Record Imaging Order	6
Task 2h: Change Imaging Order	6
Task 2i: Access Imaging Order	7
Task 3a: Drug-drug and Drug-Allergy interactions checks.....	7
Task 3b: Adjustment of severity level of drug-drug interventions.....	7
Task 4a: Record a problem.....	7
Task 4b: Change a problem & display active and historical problem list.....	7
Task 5a: Record Medication List	7
Task 5b: Edit Medication List	7
Task 5c: Access Historical Medication List	7
Task 6a: Record Allergy List	7
Task 6b: Modify Allergy List	7
Task 7a: Problem List Intervention	7
Task 7b: Problem List Intervention Infobutton.....	7
Task 7d: Medication List Intervention.....	7
Task 7e: Medication List Intervention Infobutton.....	7
Task 7f: Medication Allergy List Intervention.....	8

Task 7g: Demographics Intervention	8
Task 7h: Demographics Intervention Infobutton	8
Task 7i: Lab Results Intervention	8
Task 7j: Vital Signs Intervention	8
Task 7k: Combination Intervention.....	8
Task 9a: Clinical Reconciliation	8
Task 7l Trigger Interventions during Clinical Reconciliation	8
Task 9b: Generate new C-CDA from the reconciled information.	8
Task 8a: Record implantable device.	8
Task 8b: Change status of implantable device.	8
Task 8c: View the details of implantable device.	8
Task 10a: Create NewRx message	8
Task 10b: ChangeRx message	8
Task 10e: Review Fill Status message	9
Task 10c: Cancel RX message	9
Task 10d: Refill message	9
Task 10f: Medication History message	9
PROCEDURES.....	9
TEST LOCATION.....	9
TEST ENVIRONMENT.....	9
TEST FORMS AND TOOLS.....	9
PARTICIPANT INSTRUCTIONS.....	10
USABILITY METRICS.....	10
RESULTS.....	11
DATA ANALYSIS AND REPORTING.....	11
DISCUSSION OF THE FINDINGS.....	12

EXECUTIVE SUMMARY

A usability test of **Medical Concierge EMR v. 3.0** was conducted on June 25, 2014 at Iowa Cancer Specialists, PC by OSS, LLC. The purpose of this test was to test and validate the usability of the current user interface, and provide evidence of usability in the EHR Under Test (EHRUT). During the usability test, 10 healthcare workers matching the target demographic criteria served as participants and used the EHRUT in simulated, but representative tasks.

This study collected performance data on 7 tasks typically conducted on an EHR:

- 170.315(a)(1) CPOE – Medications
- 170.315(a)(2) CPOE – Laboratory
- 170.315(a)(3) CPOE – Diagnostic Imaging
- 170.315(a)(4) Drug-drug, Drug-allergy Interaction Checks
- 170.315(a)(5) Demographics
- 170.315(a)(6) Problem List
- 170.315(a)(7) Medication List
- 170.315(a)(8) Medication Allergy List
- 170.315(a)(9) Clinical Decision Support
- 170.315(a)(14) Implantable Device List
- 170.315(b)(2) Clinical Information Reconciliation and Incorporation
- 170.315(b)(3) Electronic Prescribing

During the 60 minute one-on-one usability test, each participant was greeted by the administrator and asked to complete a participant demographic form; Participants had prior experience with the EHR. The administrator introduced the test, and instructed participants to complete a series of tasks (given one at a time) using the EHRUT. During the testing, the administrator timed the test and, along with the data logger(s) recorded user performance data on paper and electronically.

The following types of data were collected for each participant:

- Number of tasks successfully completed
- Time to complete the tasks
- Number and types of errors
- Path deviations
- Participant's satisfaction ratings of the system

All participant data was de-identified - no correspondence could be made from the identity of the participant to the data collected. Following the conclusion of the testing, participants were asked to complete a post-test questionnaire. Various recommended metrics, in accordance with the examples set forth in the NIST Guide to the Processes Approach for Improving the Usability of Electronic Health Records, were used to evaluate the usability of the EHRUT. Following is a summary of the performance and rating data collected on the EHRUT.

INTRODUCTION

The EHRUT tested for this study was **Medical Concierge EMR v. 3.0**. Designed to present medical information to healthcare providers in Outpatient Oncology Clinics, the EHRUT consists of both a Practice Management System and an EHR. The usability testing attempted to represent realistic exercises and conditions.

The purpose of this study was to test and validate the usability of the current user interface, and provide evidence of usability in the EHR Under Test (EHRUT). To this end, measures of effectiveness, efficiency and user satisfaction were captured during the usability testing.

METHOD

PARTICIPANTS

The intended participants were healthcare professionals of varying roles and levels of experience with the EHRUT.

A total of 10 participants were tested on the EHRUT(s). Participants in the test were nurses, medical assistants, and billers. Participants were recruited by OSS, LLC. In addition, participants had no direct connection to the development of or organization producing the EHRUT(s). Participants were not from the testing or supplier organization. Participants were given the opportunity to have the same orientation and level of training as the actual end users would have received. The participant's demographic information can be found in the SED Checklist.

Participants were scheduled for 60 minute sessions with 15 minutes in between each session for debrief by the administrator(s) and data logger(s), and to reset systems to proper test conditions.

STUDY DESIGN

Overall, the objective of this test was to uncover areas where the application performed well - that is, effectively, efficiently, and with satisfaction - and areas where the application failed to meet the needs of the participants. The data from this test may serve as a baseline for future tests with an updated version of the same EHR and/or comparison with other EHRs provided the same tasks are used. In short, this testing serves as both a means to record or benchmark current usability, but also to identify areas where improvements must be made.

During the usability test, participants interacted with **one** EHR. Each participant used the system in the same location, and was provided with the same instructions. The system was evaluated for effectiveness, efficiency and satisfaction as defined by measures collected and analyzed for each participant:

- Number of tasks successfully completed
- Time to complete the tasks
- Number and types of errors
- Path deviations
- Participant's satisfaction ratings of the system

Additional information about the various measures can be found in Section 3.9 on Usability Metrics.

TASKS

Tasks were selected based on the following meaningful use requirements:

- 170.315(a)(1) CPOE – Medications
- 170.315(a)(2) CPOE – Laboratory
- 170.315(a)(3) CPOE – Diagnostic Imaging

- 170.315(a)(4) Drug-drug, Drug-allergy Interaction Checks
- 170.315(a)(5) Demographics
- 170.315(a)(6) Problem List
- 170.315(a)(7) Medication List
- 170.315(a)(8) Medication Allergy List
- 170.315(a)(9) Clinical Decision Support
- 170.315(a)(14) Implantable Device List
- 170.315(b)(2) Clinical Information Reconciliation and Incorporation
- 170.315(b)(3) Electronic Prescribing

Task 1a: Record Demographics

“Create a new patient record for Test Patient, dob 01/01/2000, 100 Main St, Davenport, IA 55555, Male, Subjective Gender: Male, Sexual Orientation: Unknown, Race: Asian; Ethnicity: Not Hispanic or Latino, Language: French, Provider – John Smith, Chart Location: EMR, Diagnosis Date is 01/01/2010.”

Task 1b: Change & Display Demographics

“Change the dob to 01/01/2001, the gender to Female, the administrative gender to Female, the sexual orientation to “Declined to Provide”, the race to Black or African American, the ethnicity to 'Hispanic or Latino', and the preferred language to English”

Task 2a: Record Medication Order

“The patient needs a prescription for Xanax 0.25 mg tablet with a sig of “qd”, a quantity of 10, no refills, dispensing method is “Dispense Locally”, and the prescriber is John Smith. Accept the other defaults. Save the prescription but do not e-prescribe it.”

Task 2b: Change Medication Order

“The physician would like to change the number of refills from 0 to 1. Please make the change.”

Task 2c: Access Medication Order

“Please display the changed prescription on the screen and then close it without saving.”

Task 2d: Record Laboratory Order

“Change to clinical-patient view and login as demo, demo; Start at the chart view with Test Patient selected. Order a 'Today' CBC.”

Task 2e: Change Laboratory Order

“Change the starting date of the order to tomorrow.”

Task 2f: Access Laboratory Order

“Please display the changed lab order and then close it without saving.”

Task 2g: Record Imaging Order

“Order a 'Today' Pet Scan.”

Task 2h: Change Imaging Order

“Change the starting date of the order to tomorrow.”

Task 2i: Access Imaging Order

"Please display the changed imaging order and then close it without saving."

Task 3a: Drug-drug and Drug-Allergy interactions checks

"Change to Normal Patient View and restart MOMS. Go to Barbara Manatee's chart. The patient needs to be prescribed Zofran 4 mg Tablet. Select the medication for the prescription. An interaction alert will be triggered. Cancel the alert dialog and the drug lookup dialog."

Task 3b: Adjustment of severity level of drug-drug interventions

"Adjust the Drug-Drug Interactions severity level to "Severe."

Task 4a: Record a problem

"Add the ICD-10 diagnosis Q64.19 – OTH EXSTROPHY URINARY BLADDER"

Task 4b: Change a problem & display active and historical problem list

"Change the date of the Q64.19 problem to the previous day."

Task 5a: Record Medication List

"Please add the following medication as an outside medication to the selected patient's record:"

Tylenol 325 mg tablet

Sig: PRN

Task 5b: Edit Medication List

"Please mark the outside medication you just added inactive."

Task 5c: Access Historical Medication List

"Click the ALL radiobutton to show both active and inactive meds."

Task 6a: Record Allergy List

"Record an allergy to penicillins for the patient. The reaction is hives and the severity is moderate and the onset date is today."

Task 6b: Modify Allergy List

"Change the penicillin allergy's severity to Life-Threatening."

Task 7a: Problem List Intervention

"In Test Patient, go to assign a treatment protocol and then display a list of therapeutic protocols by filtering on the Rectal Cancer diagnosis."

Task 7b: Problem List Intervention Infobutton

"Click the diagnostic and therapeutic reference link for C18.9 Malig Neoplasm Colon, UNSPC."
ask 7c: Problem List Intervention CDS Attributes

"Click the CDS Attribute button."

Task 7d: Medication List Intervention

"Prescribe naproxen 375 mg tablet and observe the intervention alert."

Task 7e: Medication List Intervention Infobutton

"Click on Naproxen link to see diagnostic and therapeutic reference."

Task 7f: Medication Allergy List Intervention

"Bring up Andy Abaxis's chart; assign the Capecitabine/Oxaliplatin protocol; cancel the allergy alert dialog; observe the intervention alert."

Task 7g: Demographics Intervention

"Select Dan Young in the chart-view. Edit the clinical encounter. Click on the Check-out tab. Click the "Finish" button. Observe the alert message."

Task 7h: Demographics Intervention Infobutton

"From the alert dialog, access the Diagnostic and Therapeutic Reference link."

Task 7i: Lab Results Intervention

"Select Maria Jenkins in the chart-view. Add a Chemo-encounter to the Abraxane Weekly Regimen1 chemo regimen for today's date. View the Insufficient labs message that displays."

Task 7j: Vital Signs Intervention

"Edit the clinical encounter from 08/31/2017. Click on the Check-out tab and click the "Finish" button. A BMI Management dialog will display since the patient is overweight. "

Task 7k: Combination Intervention

"Select Betty Beats' chart. Assign the Adria/Taxotere Wkly w/IRX protocol. View the alert"

Task 9a: Clinical Reconciliation

"Reconcile problems, medications, and allergies for Andy Abaxis in the transition queue. Both naproxen and naprosyn will be presented as options. Select naproxen 250 mg."

Task 7l Trigger Interventions during Clinical Reconciliation

"View the alert to order labs for the breast cancer diagnosis and click ok; View the alert about drug allergies and treating Stage III Colon Cancer and click ok; View the alert warning about naproxen and Q64.19 and click ok."

Task 9b: Generate new C-CDA from the reconciled information.

"Select Andy Abaxis' chart. Transmit the top clinical encounter. Do not omit any sections for the summary."

Task 8a: Record implantable device.

"Select Test Patient's chart. Click on the Devices tab."

Task 8b: Change status of implantable device.

"Disable the selected device."

Task 8c: View the details of implantable device.

"View the details of the selected device."

Task 10a: Create NewRx message

"Go Grant Custer's chart. E-prescribe the existing diclofenac prescription."

Task 10b: ChangeRx message

"Approve the change request for reduced dosage (from 1 tablet 4x per day to 3x per day). John Smith is the responding prescriber. Stick to same drug name when prompted."

Task 10e: Review Fill Status message

"Review the fill status message to note that the changed medication was fully filled."

Task 10c: Cancel RX message

"Select Susanne Adirondack's chart. Eprescribe the existing prescription of hydrochlorothiazide. Then, cancel the prescription and view the response from the pharmacy."

Task 10d: Refill message

Use the 1st Refill Rx scenario.

"Select Elizabeth Itasca's chart. Eprescribe the existing prescription of Lanoxin. Then, receive the refill request from the pharmacy and approve all the requested refills."

Task 10f: Medication History message

"Select John Yosemite's chart. Request medication history. View the response."

PROCEDURES

Upon arrival, participants were greeted; their identity was verified. Participants were then assigned a participant ID. Each participant filled out a participant demographic form.

The administrator moderated the session including administering instructions and tasks. The administrator also monitored task times, obtained post-task rating data, and took notes on participant comments. The administrator also served as the data logger and took notes on task success, path deviations, number and type of errors, and comments.

For each task, the participants were given a written copy of the task. Task timing began once the administrator finished reading the question. The task time was stopped once the participant indicated they had successfully completed the task. Scoring is discussed below in Section 3.9.

Following the session, the administrator gave the participant the post-test questionnaire (e.g., the System Usability Scale, see Appendix 5), and thanked each individual for their participation.

Participants' demographic information, task success rate, time on task, errors, deviations, verbal responses, and post-test questionnaire were recorded into a spreadsheet.

TEST LOCATION

The testing room was quiet and included a table and computer for the participant. The recording software was installed on the participant's computer. Only the participant and administrator were in the test room. To ensure that the environment was comfortable for users, noise levels were kept to a minimum with the ambient temperature within a normal range. All of the safety instruction and evacuation procedures were valid, in place, and visible to the participants.

TEST ENVIRONMENT

The EHRUT would be typically be used in a healthcare office or facility. In this instance, the testing was conducted in a healthcare facility. For testing, the computer used was an Apple iMac. The participants used mouse and keyboard when interacting with the EHRUT.

The EHRUT used a 27" display at 2560x1440 resolution and hi-res color settings. The application was set up by OSS, LLC according to the vendor's documentation describing the system set-up and preparation. The participant ran the application remotely from the administrator's computer via GoToMeeting. The system performance (i.e., response time) was representative to what actual users would experience in a field implementation. Additionally, participants were not allowed to change any of the default system settings (such as control of font size).

TEST FORMS AND TOOLS

During the usability test, various documents and instruments were used, including:

1. Moderator's Guide

2. User Instructions

3. Post-test Questionnaire (SUS)

The user instructions equate to the task list above. The Moderator's Guide was devised so as to be able to capture required data and includes the System Usability Survey (SUS). The Moderator's Guide is included as a separate document with this report.

The participant's interaction with the EHRUT was able to be viewed by the administrator on the administrator's computer using GoToMeeting.

PARTICIPANT INSTRUCTIONS

Thank you for participating in the usability testing of Medical Concierge EMR. This is not a test of your proficiency in using the software but a test of the usability of the software. Each task will be timed. The instruction sheet in front of you will explain how to complete each task. If you are unfamiliar with a certain task, a brief training will be given prior to the task.

USABILITY METRICS

According to the NIST Guide to the Processes Approach for Improving the Usability of Electronic Health Records, EHRs should support a process that provides a high level of usability for all users. The goal is for users to interact with the system effectively, efficiently, and with an acceptable level of satisfaction. To this end, metrics for effectiveness, efficiency and user satisfaction were captured during the usability testing. The goals of the test were to assess:

1. Effectiveness by measuring participant success rates and errors
2. Efficiency by measuring the average task time and path deviations
3. Satisfaction by measuring ease of use ratings

DATA SCORING

The following table details how task were scored, errors evaluated, and the time data analyzed.

Measures	Rationale and Scoring
Effectiveness: Task Success	<p>A task was counted as a "Success" if the participant was able to achieve the correct outcome, without assistance, within the time allotted on a per task basis.</p> <p>The total number of successes were calculated for each task and then divided by the total number of times that task was attempted. The results are provided as a percentage.</p> <p>Task times were recorded for successes. Observed task times divided by the optimal time for each task is a measure of optimal efficiency.</p> <p>Optimal task performance time, as benchmarked by expert performance under realistic conditions, is recorded when constructing tasks. Target task times used for task times in the Moderator's Guide must be operationally defined by taking multiple measures of optimal performance and multiplying by some factor [e.g., 1.25] that allows some time buffer because the participants are presumably not trained to expert performance. Thus, if expert, optimal performance on a task was [x] seconds then allotted task time performance was [x * 1.25] seconds. This ratio should be aggregated across tasks and reported with mean and variance scores.</p>
Effectiveness: Task Failures	<p>If the participant abandoned the task, did not reach the correct answer or performed it incorrectly, or reached the end of the allotted time before successful completion, the task was counted as an "Failures." No task times were taken for failures.</p> <p>The total number of errors was calculated for each task and then divided by the total number of times that task was attempted. Not all deviations would be counted as errors. This should also be expressed as the mean number of failed tasks per participant.</p> <p>On a qualitative level, an enumeration of errors and error types should be collected.</p>

<p>Efficiency:</p> <p>Task Deviations</p>	<p>The participant's path (i.e., steps) through the application was recorded. Deviations occur if the participant, for example, went to a wrong screen, clicked on an incorrect menu item, followed an incorrect link, or interacted incorrectly with an on-screen control. This path was compared to the optimal path. The number of steps in the observed path is divided by the number of optimal steps to provide a ratio of path deviation.</p> <p>It is strongly recommended that task deviations be reported. Optimal paths (i.e., procedural steps) should be recorded when constructing tasks.</p>
<p>Efficiency:</p> <p>Task Time</p>	<p>Each task was timed from when the administrator said "Begin" until the participant said, "Done." If he or she failed to say "Done," the time was stopped when the participant stopped performing the task. Only task times for tasks that were successfully completed were included in the average task time analysis. Average time per task was calculated for each task. Variance measures (standard deviation and standard error) were also calculated.</p>
<p>Satisfaction:</p> <p>Task Rating</p>	<p>Participant's subjective impression of the ease of use of the application was measured by administering both a simple post-task question as well as a post-session questionnaire. After each task, the participant was asked to rate "Overall, this task was:" on a scale of 1 (Very Difficult) to 5 (Very Easy). These data are averaged across participants.</p> <p>Common convention is that average ratings for systems judged easy to use should be 3.3 or above.</p> <p>To measure participants' confidence in and likeability of the [EHRUT] overall, the testing team administered the System Usability Scale (SUS) post-test questionnaire. Questions included, "I think I would like to use this system frequently," "I thought the system was easy to use," and "I would imagine that most people would learn to use this system very quickly." See full System Usability Score questionnaire in Appendix 5.</p>

RESULTS

DATA ANALYSIS AND REPORTING

The results of the usability test were calculated according to the methods specified in the Usability Metrics section above. Participants who failed to follow session and task instructions had their data excluded from the analyses. The usability testing results for the EHRUT are included in the SED Checklist spreadsheet. 

DISCUSSION OF THE FINDINGS

EFFECTIVENESS

The EHRUT scored very well in all categories of Effectiveness, Efficiency, and Satisfaction.

Based on the success, failure and path deviation data, the EHRUT scores very high in effectiveness. All participants completed the tasks successfully on the first attempt and the average path deviation for all tasks was 1.09.

EFFICIENCY

Based on the observations of the task time and deviation data, the EHRUT scored high in efficiency. The average standard deviation for all tasks was 10.5 seconds and the average time deviation (actual time/optimal time) for all tasks was 1.4.

SATISFACTION

Based on the task ratings and SUS results data, the EHRUT scored very well in satisfaction. All task were rated very easy (5 on a scale of 5 to 1) and the average SUS score was 98%.

MAJOR FINDINGS

All the participants had favourable impressions of the EHRUT. The errors made by the users were very few and innocuous as concerns patient safety.

AREAS FOR IMPROVEMENT

Two areas of improvement came to light during the testing. The first concerns the lookup buttons next to various fields in the program. Some users attempted to type in this field rather than click on the lookup button. The field needs a better indicator that it is not editable. The second concerns the location of the Reconcile button in the Transition Queue. It is a great distance from the top record of the queue and so causes the user to search for it.

MODERATOR'S GUIDE

Administrator _____
Data Logger _____
Date _____ Time _____
Participant # _____
Location _____

Table of Contents

Prior to testing.....	4
Orientation.....	4
Task 1a: Record Demographics	5
Administrator / Note-taker Comments:.....	5
Task 1b: Change & Display Demographics.....	5
Administrator / Note-taker Comments:.....	5
Task 2a: Record Medication Order	5
Administrator / Notetaker Comments:.....	5
Task 2b: Change Medication Order	5
Task 2c: Access Medication Order	6
Administrator / Note-taker Comments:.....	6
Task 2d: Record Laboratory Order	6
Task 2e: Change Laboratory Order	6
Task 2f: Access Laboratory Order	7
Administrator / Note-taker Comments:.....	7
Task 2g: Record Imaging Order	7
Task 2h: Change Imaging Order	7
Task 2i: Access Imaging Order	7
Administrator / Note-taker Comments:.....	8
Task 3a: Drug-drug and Drug-Allergy interactions checks.....	8
Administrator / Note-taker Comments:.....	8
Task 3b: Adjustment of severity level of drug-drug interventions.....	8
Administrator / Note-taker Comments:.....	8
Task 4a: Record a problem.....	8
Administrator / Note-taker Comments:.....	8
Task 4b: Change a problem & display active and historical problem list.....	9
Administrator / Note-taker Comments:.....	9
Task 5a: Record Medication in Active List.....	9
Administrator / Note-taker Comments:.....	9
Task 5b: Edit Medication.....	9
Administrator / Note-taker Comments:.....	9
Task 5c: Access Historical Medication List	9
Administrator / Note-taker Comments:.....	10
Task 6a: Record Allergy List	10
Administrator / Note-taker Comments:.....	10
Task 6b: Modify Allergy List	10
Administrator / Note-taker Comments:.....	10
Task 7a: Problem List Intervention	10
Administrator / Note-taker Comments:.....	10
Task 7b: Problem List Intervention Infobutton.....	11
Administrator / Note-taker Comments:.....	11
Task 7c: Problem List Intervention CDS Attributes.....	11
Administrator / Note-taker Comments:.....	11
Task 7d: Medication List Intervention.....	11
Administrator / Note-taker Comments:.....	11
Task 7e: Medication List Intervention Infobutton.....	11
Administrator / Note-taker Comments:.....	11
Task 7f: Medication Allergy List Intervention.....	12
Administrator / Note-taker Comments:.....	12
Task 7g: Demographics Intervention	12
Administrator / Note-taker Comments:.....	12
Task 7h: Demographics Intervention Infobutton	12
Administrator / Note-taker Comments:.....	12
Task 7i: Lab Results Intervention	12
Administrator / Note-taker Comments:.....	13
Task 7j: Vital Signs Intervention	13

Administrator / Note-taker Comments:.....	13
Task 7k: Combination Intervention.....	13
Administrator / Note-taker Comments:.....	13
Task 9a: Clinical Reconciliation	13
Administrator / Note-taker Comments:.....	14
Task 7l Trigger Interventions during Clinical Reconciliation	14
Administrator / Note-taker Comments:.....	14
Task 9b: Generate new C-CDA from the reconciled information.	14
Administrator / Note-taker Comments:.....	14
Task 8a: Record implantable device.	14
Administrator / Note-taker Comments:.....	14
Task 8b: Change status of implantable device.	14
Administrator / Note-taker Comments:.....	15
Task 8c: View the details of implantable device.	15
Administrator / Note-taker Comments:.....	15
Task 10a: Create NewRx message	15
Administrator / Note-taker Comments:.....	15
Task 10b: ChangeRx message	15
Administrator / Note-taker Comments:.....	15
Task 10e: Review Fill Status message	16
Administrator / Note-taker Comments:.....	16
Task 10c: Cancel RX message	16
Administrator / Note-taker Comments:.....	16
Task 10d: Refill message	16
Administrator / Note-taker Comments:.....	16
Task 10f: Medication History message	17
Administrator / Note-taker Comments:.....	17
Comments:.....	18
Appendix 5: SYSTEM USABILITY SCALE QUESTIONNAIRE.....	19

Prior to testing

- ♣ Confirm schedule with Participants
- ♣ Ensure EHRUT lab environment is running properly
- ♣ Ensure lab and data recording equipment is running properly

Prior to each participant:

- ♣ Reset application
- ♣ Start session recordings with tool

Prior to each task:

- ♣ Reset application to starting point for next task

After each participant:

- ♣ End session recordings with tool

After all testing

- ♣ Back up all video and data files

Orientation

Thank you for participating in this study. Our session today will last 30-45 minutes. During that time you will take a look at an electronic health record system.

I will ask you to complete a few tasks using this system and answer some questions. We are interested in how easy (or how difficult) this system is to use, what in it would be useful to you, and how we could improve it. You will be asked to complete these tasks on your own trying to do them as quickly as possible with the fewest possible errors or deviations. Do not do anything more than asked. If you get lost or have difficulty I cannot help you with anything to do with the system itself. Please save your detailed comments until the end of a task or the end of the session as a whole when we can discuss freely.

The product you will be using today is the production version. Some of the data may not make sense as it is placeholder data.

We are recording the audio and screenshots of our session today. All of the information that you provide will be kept confidential and your name will not be associated with your comments at any time.

Do you have any questions or concerns?

Task 1a: Record Demographics

“Create a new patient record for Test Patient, dob 01/01/2000, 100 Main St, Davenport, IA 55555, Male, Subjective Gender: Male, Sexual Orientation: Unknown, Race: Asian; Ethnicity: Not Hispanic or Latino, Language: French, Provider – John Smith, Chart Location: EMR, Diagnosis Date is 01/01/2010.”

Task Time: _____ Seconds

Optimal Path: From Patient View – “New” | Enter information | “Save” Button

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 1b: Change & Display Demographics

“Change the dob to 01/01/2001, the gender to Female, the administrative gender to Female, the sexual orientation to “Declined to Provide”, the race to Black or African American, the ethnicity to 'Hispanic or Latino', and the preferred language to English”

Task Time: _____ Seconds

Optimal Path: From Patient View – Edit button | Change info | Save button.

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 2a: Record Medication Order

“The patient needs a prescription for Xanax 0.25 mg tablet with a sig of “qd”, a quantity of 10, no refills, dispensing method is “Dispense Locally”, and the prescriber is John Smith. Accept the other defaults. Save the prescription but do not e-prescribe it.”

Task Time: _____ Seconds

Optimal Path: From Chart View ◊ Click on Prescription Tab ◊ “New” Button ◊ Type in “Xanax” in the search dialog | Select the 0.25 mg formulation | “Select” Button ◊ Select the physician | select or enter sig | “Select” Button | Populate dialog with required data. | “Save” Button

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Notetaker Comments:

Task 2b: Change Medication Order

“The physician would like to change the number of refills from 0 to 1. Please make the change.”

Task Time: _____ Seconds

Optimal Path: From Prescription Tab | “Edit” Button | Change refills | “Save” Button

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 2c: Access Medication Order

“Please display the changed prescription on the screen and then close it without saving .”

Task Time: _____ Seconds

Optimal Path: From Prescription Tab | “Edit” Button | “Cancel” Button

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 2d: Record Laboratory Order

“Change to clinical-patient view and login as demo, demo; Start at the chart view with Test Patient selected.
Order a 'Today' CBC. ”

Task Time: _____ Seconds

Optimal Path: From Chart View ◊ Click on Orders Tab ◊ “New” Button ◊ Click the 'T' checkbox next to CBC |
Click Done Button

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Notetaker Comments:

Task 2e: Change Laboratory Order

“Change the starting date of the order to tomorrow.”

Task Time: _____ Seconds

Optimal Path: From Orders Tab | “Edit” Button | Change Date | “Save” Button

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 2f: Access Laboratory Order

“Please display the changed lab order and then close it without saving .”

Task Time: _____ Seconds

Optimal Path: From Orders Tab | “Edit” Button | “Cancel” Button

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 2g: Record Imaging Order

“Order a 'Today' Pet Scan.”

Task Time: _____ Seconds

Optimal Path: From Orders Tab | “New” Button ◊ Click the 'T' checkbox next to PET SCAN | Click Done Button

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Notetaker Comments:

Task 2h: Change Imaging Order

“Change the starting date of the order to tomorrow .”

Task Time: _____ Seconds

Optimal Path: From Orders Tab | “Edit” Button | Change Date | “Save” Button

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 2i: Access Imaging Order

“Please display the changed imaging order and then close it without saving.”

Task Time: _____ Seconds

Optimal Path: From Orders Tab | “Edit” Button | “Cancel” Button

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 3a: Drug-drug and Drug-Allergy interactions checks

Start with D-D Alert Level = Moderate and D-A Alert Level = Moderate.

“Change to Normal Patient View and restart MOMS. Go to Barbara Manatee's chart. The patient needs to be prescribed Zofran 4 mg Tablet. Select the medication for the prescription. An interaction alert will be triggered. Cancel the alert dialog and the drug lookup dialog.”

Task Time: _____ Seconds

Optimal Path: Select the patient | Click on Prescription Tab | “New” Button | Type in “Zofran” in the search dialog | Select the formulation | “Select” Button

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 3b: Adjustment of severity level of drug-drug interventions

“Adjust the Drug-Drug Interactions severity level to “Severe.”

Task Time: _____ Seconds

Optimal Path: Tools->| Preferences | Select “Severe” in the Drug-Drug Interaction Severity dropdown | Save Button

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 4a: Record a problem

“Add the ICD-10 diagnosis Q64.19 – OTH EXSTROPHY URINARY BLADDER”

Task Time: _____ Seconds

Optimal Path: From the Patient View → Select Diagnosis tab | Edit button | Click Assign | Enter Q64.19 into the resulting Code column | Press Tab key | Save button

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 4b: Change a problem & display active and historical problem list

“Change the date of the Q64.19 problem to the previous day.”

Task Time: _____ **Seconds**

Optimal Path: From Diagnosis Tab – “Edit” Button | Enter the new date into the table | Press Enter | “Save” Button

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 5a: Record Medication in Active List

“Please add the following medication as an outside medication to the selected patient's record:”

Tylenol 325 mg tablet

Sig: PRN

Task Time: _____ **Seconds**

Optimal Path: Select Medications tab | New button | Search on Tylenol | Select formulation | “Save” Button

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 5b: Edit Medication

“Please mark the outside medication you just added inactive.”

Task Time: _____ **Seconds**

Optimal Path: From Medication Tab – Click “Active” checkbox in med table | Save button

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 5c: Access Historical Medication List

“Click the ALL radiobutton to show both active and inactive meds.”

Task Time: _____ **Seconds**

Optimal Path: From Medication Tab – Click “ALL” radiobutton in med table

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 6a: Record Allergy List

“Record an allergy to penicillins for the patient. The reaction is hives and the severity is moderate and the onset date is today.”

Task Time: _____ **Seconds**

Optimal Path: Select Allergy Tab | “New” Button | “Lookup” Button | Search for Penicillin | Select Penicillins Allergen Group | Enter “Hives” as the reaction | “Save” Button

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 6b: Modify Allergy List

“Change the penicillin allergy’s severity to Life-Threatening.”

Task Time: _____ **Seconds**

Optimal Path: From Allergy Tab – “Edit” Button | Select “Life-Threatening” from the severity dropdown | “Save” Button

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 7a: Problem List Intervention

“In Test Patient: go to assign a treatment protocol and then display a list of therapeutic protocols by filtering on the Rectal Cancer diagnosis.”

Task Time: _____ **Seconds**

Optimal Path: Click on Treatment tab | New button under Regimen Table | In ChemoProtocolLookup: “Diagnosis” Button | Type “Rectal Cancer” | Select

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 7b: Problem List Intervention Infobutton

“Click the diagnostic and therapeutic reference link for C18.9 Malignant Neoplasm of Colon, UNSPECIFIED.”

Task Time: _____ **Seconds**

Optimal Path: Click link

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 7c: Problem List Intervention CDS Attributes

“Click the CDS Attribute button.”

Task Time: _____ **Seconds**

Optimal Path: Click link

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 7d: Medication List Intervention

“Prescribe naproxen 375 mg tablet and observe the intervention alert.”

Task Time: _____ **Seconds**

Optimal Path: Click on prescription tab | New button | search on Naproxen | Select formulation

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 7e: Medication List Intervention Infobutton

“Click on Naproxen link to see diagnostic and therapeutic reference.”

Task Time: _____ **Seconds**

Optimal Path: Click link.

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 7f: Medication Allergy List Intervention

“Bring up Andy Abaxis's chart; assign the Capecitabine/Oxaliplatin protocol; cancel the allergy alert dialog; observe the intervention alert.”

Task Time: _____ **Seconds**

Optimal Path: Lookup and select patient | click on Treatment tab | New button | Search on “capecitabine” | select the specified protocol | cancel allergy alert dialog

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 7g: Demographics Intervention

“Select Dan Young in the chart-view. Edit the clinical encounter. Click on the Check-out tab. Click the “Finish” button. Observe the alert message.”

Task Time: _____ **Seconds**

Optimal Path: Launch the Patient Lookup | Select Test Patient | “Select” button | Clinical Encounters tab | “Edit” button | Check-out tab | “Finish” Button | View alert

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 7h: Demographics Intervention Infobutton

“From the alert dialog, access the Diagnostic and Therapeutic Reference link.”

Task Time: _____ **Seconds**

Optimal Path: Click the 'Obesity' link.

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 7i: Lab Results Intervention

“Select Maria Jenkins in the chart-view. Add a Chemo-encounter to the Abraxane Weekly Regimen1 chemo regimen for today's date. View the Insufficient labs message that displays.”

Task Time: _____ **Seconds**

Optimal Path: Select the patient | Treatments tab | “New” button under Encounter table | Accept today's date | View the Insufficient Labs message

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 7j: Vital Signs Intervention

“Edit the clinical encounter from 08/31/2017. Click on the Check-out tab and click the “Finish” button. A BMI Management dialog will display since the patient is overweight. ”

Task Time: _____ **Seconds**

Optimal Path: Clinical Encounters tab | “Edit” button for the 08/31/2017 encounter | Check-out tab | “Finish” Button | View Alert

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 7k: Combination Intervention

“Select Betty Beats' chart. Assign the Adria/Taxotere Wkly w/IRX protocol. View the alert”

Success:

- ◆ Easily completed
- ◆ Completed with difficulty or help :: Describe below
- ◆ Not completed

Comments:

Task Time: _____ **Seconds**

Optimal Path: Lookup patient | click on Treatment tab | New button | search for Adira... | Select button | View alert

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 9a: Clinical Reconciliation

“Reconcile problems, medications, and allergies for Andy Abaxis in the transition queue. Both naproxen and naprosyn will be presented as options. Select naproxen 250 mg.”

Task Time: _____ **Seconds**

Optimal Path: Tools menu | Transition Queue menu | Select patient transition | “Reconcile” button | Select the breast cancer diagnosis in the transition table and click left arrow | select the allergy from the transition table and click left arrow | Select matching FDB allergy concept in dialog | Select medication from the transition table and click left-arrow | Select FDB medication concept from dialog | “Save & Reconcile” button.

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 7I Trigger Interventions during Clinical Reconciliation

“View the alert to order labs for the breast cancer diagnosis and click ok; View the alert about drug allergies and treating Stage III Colon Cancer and click ok; View the alert warning about naproxen and Q64.19 and click ok.”

Task Time: _____ **Seconds**

Optimal Path: View and click Ok | View and click Ok | View and click Ok.

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 9b: Generate new C-CDA from the reconciled information.

“Select Andy Abaxis' chart. Transmit the top clinical encounter. Do not omit any sections for the summary.”

Task Time: _____ **Seconds**

Optimal Path: Lookup Andy Abaxis | Click on the Clinical Encounter tab | click transmit on the top encounter | click Ok.

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 8a: Record implantable device.

I will send the user a todo with the device id.

“Select Test Patient's chart. Click on the Devices tab.”

Task Time: _____ **Seconds**

Optimal Path: Lookup Test Patient | Click on the Devices tab | Add Device button | Enter
“(01)10884521062856(11)141231(17)150707(10)A213B1(21)1234” | Click Find Device | Save button

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 8b: Change status of implantable device.

“Disable the selected device.”

Task Time: _____ **Seconds**

Optimal Path: With the device selected, click Enable/Disable Device | Ok button

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 8c: View the details of implantable device.

“View the details of the selected device.”

Task Time: _____ **Seconds**

Optimal Path: With the device selected, click View Device | Cancel button

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 10a: Create NewRx message

Make sure Preferences->Eprescribing tab->Environment == Staging and Tools->Utilities->Erx Test Tool is running and the Eprescription webapp is running. Select the 4th Change Rx Scenario. Stop timer when user clicks approval of preview.

“Go Grant Custer's chart. E-prescribe the existing diclofenac prescription.”

Task Time: _____ **Seconds**

Optimal Path: Lookup patient | Prescriptions tab | “Edit” button | “Eprescribe” button | Accept summary.

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 10b: ChangeRx message

“Approve the change request for reduced dosage (from 1 tablet 4x per day to 3x per day). John Smith is the responding prescriber. Stick to same drug name when prompted.”

Task Time: _____ **Seconds**

Optimal Path: Click on 'Checking Prescription Messages' in bottom left-hand corner | View button for selected ChangeRx message | Click on Select button for original prescription | Select button for selected prescription | Select 'John Smith' as prescriber | Select the Approve response | “Respond” button | Select correct formulation | Approve the preview.

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 10e: Review Fill Status message

“Review the fill status message to note that the changed medication was fully filled.”

Task Time: _____ **Seconds**

Optimal Path: From message dialog, View button on selected Fill message | Click on Select button for original prescription | Select button for selected prescription | Save button

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 10c: Cancel RX message

Use the 1st Cancel Rx scenario.

“Select Susanne Adirondack’s chart. Eprescribe the existing prescription of hydrochlorothiazide. Then, cancel the prescription and view the response from the pharmacy.”

Task Time: _____ **Seconds**

Optimal Path: Lookup patient | “Edit” button | “Eprescribe” button | Accept summary | Edit button | Cancel Prescription button | Click Ok | Select Cancel Prescription | Click on 'Checking Prescription Messages' in bottom left-hand corner | View button for selected Cancel Rx message

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 10d: Refill message

Use the 1st Refill Rx scenario.

“Select Elizabeth Itasca’s chart. Eprescribe the existing prescription of Lanoxin. Then, receive the refill request from the pharmacy and approve all the requested refills.”

Task Time: _____ **Seconds**

Optimal Path: Lookup patient | “Edit” button | “Eprescribe” button | Accept summary | Click on 'Checking Prescription Messages' in bottom left-hand corner | View button for selected Refill Request message | Click on Select button for original prescription | Select button for selected prescription | Select 'John Smith' as prescriber | Select the Approve response | Enter 2 for the total dispensings | “Respond” button | Approve the preview

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Task 10f: Medication History message

Use the 1st Med Hx scenario.

“Select John Yosemite's chart. Request medication history. View the response.”

Task Time: _____ **Seconds**

Optimal Path: Lookup patient | “Medication History” Menu | Click on 'Checking Prescription Messages' in bottom left-hand corner | View button for selected Med Hx message

Rating:

Overall, this task was: _____

Show participant written scale: “Very Easy” (5) to “Very Difficult” (1)

Administrator / Note-taker Comments:

Comments:

Appendix 5: SYSTEM USABILITY SCALE QUESTIONNAIRE

In 1996, Brooke published a "low-cost usability scale that can be used for global assessments of systems usability" known as the System Usability Scale or SUS. Lewis and Sauro (2009) and others have elaborated on the SUS over the years. Computation of the SUS score can be found in Brooke's paper, in at <http://www.usabilitynet.org/trump/documents/Suschapt.doc> or in Tullis and Albert (2008).

Strongly Disagree <-> Strongly Agree

1. I think that I would like to use this system frequently.	1	2	3	4	5
2. I found the system unnecessarily complex.	1	2	3	4	5
3. I thought the system was easy to use.	1	2	3	4	5
4. I think that I would need the support of a technical person to be able to use this system.	1	2	3	4	5
5. I found the various functions in this system were well integrated.	1	2	3	4	5
6. I thought there was too much inconsistency in this system.	1	2	3	4	5
7. I would imagine that most people would learn to use this system very quickly.	1	2	3	4	5
8. I found the system very cumbersome to use.	1	2	3	4	5
9. I felt very confident using the system.	1	2	3	4	5
10. I needed to learn a lot of things before I could get going with this system.	1	2	3	4	5