OBJECTIVE
MEDICAL SYSTEMS

OMS EHR System Usability Test Report

OBJECTIVE MEDICAL SYSTEMS

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1 Cover Page

EHR Usability Test Report of OMS EHR Version 2.0 (Development version)

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

Product version that was tested	2.0
Dates of Usability Test	4/20/18 through 4/26/18
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2 Executive Summary:

Usability tests of the OMS (Objective Medical Systems, LLC) EHR (Electronic Health Record EHR) was conducted between the dates 4/20/18 through 4/20/18 at an offsite location located at 225 Dunn Street, Houma, LA 70360. The purpose of these tests was to test and validate the usability of the current user interface and provide evidence of usability in the EHR under test (EHRUT).

11 individuals were selected for the study comprising of 7 Nurse Professionals, 3 Providers and 2 Clinical Practice information technology professionals. During the usability test, participants were administered **36** representative tasks spanning across the following functionalities identified within the EHR and as mandated by meaningful use stage 3 measure, 170.315(g)(3) Safety Enhanced Design.

- 170.315(a)(1) Computerized provider order entry
- 170.315(a)(2) CPOE Labs
- 170.315(a)(3) CPOE Diagnostics
- 170.315(a)(4) Drug to Drug Interactions
- 170.315(a)(5) Demographics
- 170.315(a)(6) Problem List
- 170.315(a)(7) Medication List
- 170.315(a)(8) Medication Allergy
- 170.315(a)(9) Medication list
- 170.315(a)(14) Implantable Device
- 170.315(b)(2) Clinical Information Reconciliation
- 170.315(b)(3) e-Prescribing

Each test was designed to be completed by the participant in 90 minutes. Prior to each test session, the administrator jointly reviewed the Informed consent form (Appendix B) and the Non-Disclosure Agreement (Appendix C) with the participant. Subsequently, administrator provided a 20-minute overview of the overall system functionality and walked the participants through the representative test scripts on the system to develop familiarity with the tasks that they were expected to perform. This was the only training that was provided, and no additional training materials were distributed to facilitate testing.

The Test Administrator, Data Logger and Participant joined a virtual meeting to facilitate the encounter. A video recording of the entire test session with the participant (primarily) and the administrator was also captured. The data logger was remotely located and collated the participant screen and verbal responses to the test scripts through audio and video inputs. The entire virtual meeting was also recorded and stored in compact discs.

The following types of data was collated for each of the participants

- Number of tasks completed within time
- Time to complete the tasks
- Number and types of errors
- Path deviations
- Participants satisfaction rating of the system

On conclusion of the execution of the test scripts, the participants were requested to complete the qualitative questionnaire and the SUS (system usability scale).

Each of the participants were provided with a gift card worth $50 USD as a token of appreciation by OMS for their participation in the test. Acceptance of the gift certificate was recorded on paper.

Following the conclusion of all the test sessions (concluded on 4/26/18), the test data was compiled and 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.

Measure / Tasks	N	Task Success	Path Deviation	Task Time		Errors	Task Ratings 5= Easy
	#	Mean(SD)	Deviations Observed /Optimal	Mean (SD)	Deviations Observed /Optimal	Mean (SD)	Mean (SD)
1. Enter medication orders.	A1.1	100 (0)	45 (44)	158 (51)	158 (120)	0.01 (0.3)	5 (0)
2. Change medication orders	A1.2	100 (0)	44 (44)	84 (46)	84 (120)	0 (0)	5 (0)
3. Display medication orders	A1.3	100 (0)	33 (33)	36 (22)	36 (120)	0 (0)	5 (0)
4. Enter patient's lab order.	A2.1	100 (0)	22 (22)	50 (32)	50 (60)	0 (0)	5 (0)
5. Change patient's lab order	A2.2	100 (0)	22 (22)	59 (34)	59 (50)	0 (0)	5 (0)
6. View patient's lab order.	A2.3	100 (0)	11 (11)	14 (8)	14 (10)	0 (0)	5 (0)
7. Enter patient's diagnostic imaging.	A3.1	100 (0)	22 (22)	29 (10)	50 (30)	0 (0)	5 (0)
8. Change patient's diagnostic order.	A3.2	100 (0)	22 (22)	38 (13)	38 (30)	0 (0)	5 (0)
9. View diagnostic imagining order.	A3.3	100 (0)	10 (11)	11 (7)	11 (30)	0 (0)	5 (0)
10. View the Drug-Drug	A4.1	100 (0)	33 (33)	99 (50)	99 (60)	0 (0)	4.9 (0.3)
11. Enter Medication for drug allergy.	A4.2	100 (0)	0 (0)	45 (33)	45 (30)	0 (0)	5 (0)
12. View severity levels.	A4.3	100 (0)	0 (0)	18 (8)	18 (15)	0 (0)	5 (0)

13. Add a new patient	A5.1	100 (0)	34 (33)	127 (46)	127 (75)	0 (0)	5 (0)
14. Change the information on the patient.	A5.2	100 (0)	33 (33)	69 (22)	70 (45)	0 (0)	5 (0)
15. Display changes made in demographics.	A5.3	100 (0)	33 (33)	19 (9)	19 (10)	0 (0)	5 (0)
16. Record a problem to patient's problem list.	A6.1	100 (0)	24 (22)	81 (23)	82 (60)	0 (0)	5 (0)
17. Change a problem on the problem list.	A6.2	100 (0)	22 (22)	16 (7)	16 (15)	0 (0)	5 (0)
18. Display the active and resolved problem list (historical).	A6.3	100 (0)	22 (22)	21 (18)	22 (15)	0 (0)	5 (0)
19. Electronically record patient medication list	A7.1	100 (0)	45 (44)	65 (17)	65 (50)	0 (0)	5 (0)
20. Electronically change Medication List	A7.2	100 (0)	33 (33)	87 (24)	87 (50)	0 (0)	5 (0)
21. View Electronically Access Patient Medication List and Medication List History	A7.3	100 (0)	33 (33)	47 (24)	47 (30)	0 (0)	5 (0)
22. Electronically record patient medication allergy list	A8.1	100 (0)	22 (22)	54 (28)	54 (60)	0 (0)	5 (0)
23. Electronically Change Patient Medication Allergy List	A8.2	100 (0)	22 (22)	33 (27)	33 (27)	0 (0)	5 (0)
24. Electronically Access Patient Medication Allergy history list	A8.3	100 (0)	33 (33)	24 (11)	24 (30)	0 (0)	5 (0)
25. Add a CDS intervention	A9.1	100 (0)	67 (66)	83 (32)	83 (60)	0.09 (0.3)	5 (0)

26. Trigger the CDS intervention	A9.2	73 (47)	45 (44)	110 (49)	110 (90)	0.27 (0.5)	4.9 (0.3)
27. Trigger the CDS interventions from importing TOC	A9.3	100 (0)	79 (77)	70 (15)	70 (60)	0 (0)	5 (0)
28. View Info button, citation button and reference button	A9.4	91 (30)	81 (88)	66 (20)	66 (60)	0.09 (0.3)	5 (0)
29. Electronically record Implantable Device	A14.1	100 (0)	22 (22)	47 (13)	47 (45)	0 (0)	5 (0)
30. Change UDI Status	A14.2	100 (0)	23 (22)	22 (9)	22 (10)	0.18 (0.4)	4.8 (0.6)
31. Access UDI, device description, identifiers and attributes	A14.3	100 (0)	11 (11)	24 (13)	24 (10)	0 (0)	5 (0)
32. Incorporate a CCDA	B2.1	100 (0)	51 (55)	96 (27)	96 (60)	0 (0)	4.9 (0.3)
33. Generate a new CCDA with reconciled data.	B2.2	100 (0)	44 (44)	39 (18)	39 (30)	0 (0)	5 (0)
34. Enter Medication Orders and e-Prescribe	B3.1	100 (0)	44 (44)	96 (40)	96 (90)	0 (0)	5 (0)
35. Cancel and Change prescription (dosage or duration)	B3.2	91 (30)	22 (22)	111 (46)	111 (90)	0.09 (0.3)	5 (0)
36. Refill Prescription	B3.3	100 (0)	33 (33)	76 (47)	76 (45)	0 (0)	5 (0)
37. Receive fill status notification	B3.4	100 (0)	22 (22)	58 (33)	58 (45)	0 (0)	5 (0)
38. Request and receive medication history information	B3.5	100 (0)	44 (44)	63 (22)	64 (60)	0 (0)	5 (0)

The System Usability Scale score for the subjective satisfaction with the system based on the performance of the above tasks is *4.98*

In addition to the summative (quantitative) data the following qualitative observations were made:

2.1 Major Findings

i. Bug 1: was discovered on the last day and last person. Newly sent prescriptions were not appearing in the e-Rx history.
ii. Bug 2: was found in the Implantable Device screen. The “Cancel” button was not working. The user was still able to “X” out of the screen.
iii. Bug 3: was discovered early during testing. When the user clicked on e-Rx button, they were brought into the Allergies section of the e-Rx.
iv. Effectiveness Measures:
    - Successful tasks (percentage of tasks completed within time, without help and without error) was reported at 99.78%.
    - Number of errors: 5.
v. Efficiency:
    - Average time for task completion is 59.00 seconds and standard deviation is 24.37 seconds.
vi. Learn ability: It was observed that the testers were able to increase the speed of operations as the test progressed.

2.2 Areas of Improvements

i. Updating the status of the implantable device. Users had trouble identifying that they needed to select the word “Implanted.”
ii. Users would like to have the patient’s clinic and physician already defaulted to minimize their clicks.
iii. Lag time from when a medication was prescribed and the time that elapsed for the medication to appear in the patient’s e-rx status.

3 Introduction

Objective Medical Systems, LLC (OMS) has developed a proprietary electronic health record software application (OMS EHR), primarily intended for the cardiovascular ambulatory setting care providers. This application is equipped with functionality and work flows to handle real time outpatient clinic scenarios such as

- Patient check in
- Registration
- Patient work up
- Consultation
- Documenting patient encounter in patient charts
- CPOE of medications, clinical labs and radiological labs
- Electronic prescribing
- Patient education
- Interoperability with health exchanges

The objective of the usability test was to demonstrate and provide evidence for the usability of the application and obtain summative and qualitative insights into product refinement. Towards this goal, the study was designed to collate quantitative and qualitative data across parameters like effectiveness (% of successful tasks), efficiency (time on task) and user satisfaction (system usability scale).

The version of the application utilized for the usability test is version 2.0 which is an advanced version very close to the market release version OMS EHR v 2.0.

4 Usability Study Method

4.1 Study Participants

Objective Medical Systems, LLC (OMS) actively enlisted the study participants from the local care provider community across both ambulatory and hospital settings. A total of 11 invitations (Exhibit A) were sent to which 11 individuals accepted. The invite letters indicated the objective of the test, the scope of the testing and the duration of the test sessions (90 minutes). None of the participants have any direct relationship or interest with OMS or OMS suppliers. Diligence was applied to secure a study group with diversity across user profiles settings of care. No promise or assurance of gifts (either monetary or in kind) were communicated during screening.

The following criteria was applied to the selection of test participants.

1) Medical professionals including care providers, technologists, Medical IT support staff
2) Experience of having used EHR's in the past in a clinical setting
3) Ambulatory or Hospital setting
4) Good understanding of cardiovascular practice work flows.

The following is the table of participants by characteristic's including demographics, professional experience, computing experience and user needs for assistive technology. Participant names have been replaced with identifiers to protect participant privacy.

Participant Identifier	Participant Gender	Participant Age	Participant Education	Participant Occupation/Role	Participant Professional Experience	Participant Computer Experience	Participant Product Experience	Participant Assistive Technology Needs
ID:01	Female	30-39	Bachelor's Degree	LPN	3	20	3	No

ID:02	Female	30-39	Bachelor's Degree	LPN/Informations Systems	11	20	3	No
ID:03	Female	30-39	Bachelor's Degree	LPN	10	20	3	No
ID:04	Female	30-39	Bachelor's Degree	LPN	7	20	3	No
ID:05	Male	30-39	Associate degree	RN	19	25	3	No
ID:06	Male	40-49	Bachelor's Degree	Director of Clinical Info Sys	12	20	3	No
ID:07	Female	40-49	Bachelor's Degree	RN	13	20	3	No
ID:08	Male	40-49	Bachelor's Degree	RN	20	25	3	No
ID:09	Male	40-49	Master's Degree	NP	12	25	3	No
ID:10	Male	40-49	Doctorate degree (e.g., MD, DNP, DMD, PhD)	MD	10	25	3	No
ID:11	Male	40-49	Doctorate degree (e.g., MD, DNP, DMD, PhD)	MD	9	25	3	No

All 11 participants who accepted the invitation appeared for the test. The test sessions were scheduled for a 90 minute with no breaks once the training was completed and the test scripts initiated.

4.2 Study Design

The OMS EHR Usability test was conducted with the primary objective of measuring the effectiveness, efficiency and user satisfaction in using the OMS EHR application and also uncover areas of improvement.

The data from this test would also serve as a baseline to compare usability ratings of the application to competitor products.

The scope and model of the study was kept constant for all the participants so that intelligence could be captured on how different profiles of users perceived the product usability.

The system was measured for effectiveness, efficiency and user satisfaction based on the following data points.

- Number of tasks completed within the allocated time
- Time to complete the tasks
- Number and Types of errors
- Path deviations
- Participant verbalizations (comments)
- Participants satisfaction ratings of the system

4.3 Tasks

The tasks were selected and based on the frequency of use, complexity, criticality of function and risk exposure. The test was so designed that the easier test cases were organized earlier in the test with a gradual increase in complexity and risk.

The tasks with high significance for risk (Drug-Drug Interaction) was deliberately scheduled for the end of the test so that the tester would have gained a reasonable understanding of the UI design, navigation and screen operation functions.

4.4 Procedures

The participants were welcomed at the scheduled time and escorted to the test room by the test administrator. The Data logger was also introduced to the participant and the data logger's role in the test was explained to the participant.

The participant name was validated with the schedule in the OMS calendar and an entry was logged in the OMS EHR Usability Test Cover document. The cover document contained a unique participant identification number which was released to the participant. For all future reference, the participant would be identified only with this unique identification number.

The data logger left the test room and took position in the data logging room remotely located from the test room. A virtual meeting session was initiated by the data logger and the test administrator and the test participant were invited to the virtual meeting. The

test administrator accepted the invitation for self on the administrator laptop and for the test participant on the participant laptop. All three individuals were now on the virtual meeting session. The test administrator took control as the presenter initially.

The participant was first presented with the Orientation documentation and the test administrator read the document to the participant. The participant executed the document on acceptance.

Next, the participant was presented with the Informed consent document indicating that all the material collated in the test sessions could be potentially used for research purposes. The consent to audio and video tape the session was specifically informed to the participant. The participant executed the document on acceptance.

Subsequently, the participant was presented with the NDA, indicating that all information and knowledge gathered during the test was strictly confidential and was not to be disclosed to any third party outside of the test administrator. The participant executed the document on acceptance.

Next a brief demographic questionnaire was administered to gather age, race, computer exposure, professional and EHR experience.

Next paper printed questionnaires were presented to the test participant so that the participant could familiarize themselves with the test script format.

The administrator subsequently conducted a 5-10 minutes demonstration of the application to the participant explaining the modules which the participant was expected to test. Any questions that the participant had at this point in time were answered. No further training either verbal or documented was provided.

On conclusion of the application demonstration, the administrator confirmed with participant whether they could move forward. On acknowledgement, the test administrator requested the participant to start answering the questionnaire. The administrator read the specific test script to the participant. The time taken for completion of the test script (task) was logged by the data logger. On completion of the test script, the administrator asked the participant to rate the ease of completing the task. The data logger captured the rating provided. The data logger also recorded participant facial expressions, verbalizations and errors and deviations from tasks on paper copy of the questionnaire.

After the completion of all the tasks in the questionnaire, the administrator indicated the completion of the test scripts and presented the questionnaire and the system usability scale questionnaires. The participant recorded their responses on the questionnaire and returned to the administrator.

The virtual meeting session was terminated at this time.

As a token of appreciation for participating in the test, the test administrator presented a $50 usd gift card to the participant. The acknowledgement and receipt of the gift card was recorded and executed by the test administrator, participant and the data logger.

The video camera recording was ended, and the test administrator and data logger escorted the participant out of the test room. All test documentation was collated by the data logger and securely stored for further data analysis and report development.

4.5 Test Location

The test was administered at an offsite testing room located at 225 Dunn street Houma LA 70360. This location was chosen because of the ease of access to the location for the test participants.

The test room was provided with 2 active terminals, one for the administrator and the other for the test participant, comfortable chairs and tables. The area was quiet, ambient temperature was kept normal and access restricted to any external visitors. The video recorder was placed to capture the movements of the test participant and observe the administrator. The data logger was located outside the test room and was equipped with the laptop to record the participants screen transactions and listen to the audio of the conversations between the administrator and the participant.

4.6 Test Environment

The test was conducted in an offsite office located at 225 Dunn Street Houma LA 70360. The test participant was provided with a laptop (with a webcam), and the laptop was remotely logged into the OMS Application (version 2.0) via the local area network. The OMS EHR Application version (2.0) was mounted on the client server to simulate real time server performance and experience for the users. The test participant's laptop was a Lenovo Yoga with Windows 10. An external mouse device and external keyboard was provided for easy system navigation.

Prior to start of the session, the data logger initiated a virtual meeting session and invited the administrator and the test participant to the virtual meeting session. The test administrator accepted the invite on behalf of the test participant and for self and takes control as presenter on the test participants laptop. This setting now enables the data logger to record the test participants screen interaction along with the audio to capture verbal comments and conversations with the administrator.

The participant was instructed not to change the system setup and seek help from the administrator for any system control issues.

4.7 Test Forms and Tools

The following forms and tools were used for the usability testing

4.7.1 Forms

1. Moderators Guide (Appendix D)
2. Informed Consent (Appendix A)

3. Participant Orientation (Appendix E)
4. Non-Disclosure Agreement (Appendix F)
5. Participant Questionnaire (Appendix G)
6. Post Test Questionnaire (H)
7. Acknowledgment of Gift Certificate (Appendix I)

4.7.2 Tools

1. Video recorder for recoding the session
2. Virtual Meeting software (GoToMeeting)

4.8 Participant Instructions

The administrator will use the Participant orientation form (Exhibit E) to instruct the participant through the test session methodology, scope and schedule and overall expectations.

4.9 Usability Metrics

The usability study was designed to measure metrics on

- Effectiveness of EHRUT by measuring participant success rates and errors.
- Efficiency by measuring the average time and path deviations.
- User satisfaction with EHRUT by measuring ease of use ratings.

4.9.1 Data Scoring

Measures	Rationale and Scoring
Effectiveness Task Success	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. Task times were recorded for successes. Observed task times divided by the optimal time for each task is a measure of optimal efficiency. Optimal task performance time was benchmarked by the OMS team keeping in mind realistic conditions and the limited training that the testers had received. Target task times used for task times is operationally defined by taking multiple measures of optimal performance and multiplying by 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 was aggregated across tasks and reported with mean and variance scores.
Effectiveness Task Failures	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 errors.

	On a qualitative level, an enumeration of errors and error types is collected.
Efficiency: Task Deviations	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 optimal navigational steps and operations for a particular test was recorded prior to the test. Tests which were completed within time and with a minimum of deviations (maximum 2) were recorded with the status Minimum Deviation and where the deviations where more than 2 , those scripts were recorded as Maximum deviation. The number of steps in the observed path is divided by the number of optimal steps to provide a ratio of path deviation.
Efficiency: Task Time	Each task was timed from when the administrator said "Begin" until 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.
Satisfaction: Task Rating	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. [12]

4.9.2 Data analysis and Results

Measure / Tasks	N	Task Success	Path Deviation	Task Time		Errors	Task Ratings 5= Easy
	#	Mean(SD)	Deviations Observed /Optimal	Mean (SD)	Deviations Observed /Optimal	Mean (SD)	Mean (SD)
1. Enter medication orders.	A1.1	100 (0)	45 (44)	158 (51)	158 (120)	0.01 (0.3)	5 (0)
2. Change medication orders	A1.2	100 (0)	44 (44)	84 (46)	84 (120)	0 (0)	5 (0)
3. Display medication orders	A1.3	100 (0)	33 (33)	36 (22)	36 (120)	0 (0)	5 (0)
4. Enter patient's lab order.	A2.1	100 (0)	22 (22)	50 (32)	50 (60)	0 (0)	5 (0)
5. Change patient's lab order	A2.2	100 (0)	22 (22)	59 (34)	59 (50)	0 (0)	5 (0)
6. View patient's lab order.	A2.3	100 (0)	11 (11)	14 (8)	14 (10)	0 (0)	5 (0)
7. Enter patient's diagnostic imaging.	A3.1	100 (0)	22 (22)	29 (10)	50 (30)	0 (0)	5 (0)
8. Change patient's diagnostic order.	A3.2	100 (0)	22 (22)	38 (13)	38 (30)	0 (0)	5 (0)
9. View diagnostic imagining order.	A3.3	100 (0)	10 (11)	11 (7)	11 (30)	0 (0)	5 (0)
10. View the Drug-Drug	A4.1	100 (0)	33 (33)	99 (50)	99 (60)	0 (0)	4.9 (0.3)
11. Enter Medication for drug allergy.	A4.2	100 (0)	0 (0)	45 (33)	45 (30)	0 (0)	5 (0)
12. View severity levels.	A4.3	100 (0)	0 (0)	18 (8)	18 (15)	0 (0)	5 (0)
13. Add a new patient	A5.1	100 (0)	34 (33)	127 (46)	127 (75)	0 (0)	5 (0)
14. Change the information on the patient.	A5.2	100 (0)	33 (33)	69 (22)	70 (45)	0 (0)	5 (0)
15. Display changes made in demographics.	A5.3	100 (0)	33 (33)	19 (9)	19 (10)	0 (0)	5 (0)

16. Record a problem to patient's problem list.	A6.1	100 (0)	24 (22)	81 (23)	82 (60)	0 (0)	5 (0)
17. Change a problem on the problem list.	A6.2	100 (0)	22 (22)	16 (7)	16 (15)	0 (0)	5 (0)
18. Display the active and resolved problem list (historical).	A6.3	100 (0)	22 (22)	21 (18)	22 (15)	0 (0)	5 (0)
19. Electronically record patient medication list	A7.1	100 (0)	45 (44)	65 (17)	65 (50)	0 (0)	5 (0)
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23. Electronically Change Patient Medication Allergy List	A8.2	100 (0)	22 (22)	33 (27)	33 (27)	0 (0)	5 (0)
24. Electronically Access Patient Medication Allergy history list	A8.3	100 (0)	33 (33)	24 (11)	24 (30)	0 (0)	5 (0)
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27. Trigger the CDS interventions from importing TOC	A9.3	100 (0)	79 (77)	70 (15)	70 (60)	0 (0)	5 (0)
28. View Info button, citation button and reference button	A9.4	91 (30)	81 (88)	66 (20)	66 (60)	0.09 (0.3)	5 (0)

29. Electronically record Implantable Device	A14.1	100 (0)	22 (22)	47 (13)	47 (45)	0 (0)	5 (0)
30. Change UDI Status	A14.2	100 (0)	23 (22)	22 (9)	22 (10)	0.18 (0.4)	4.8 (0.6)
31. Access UDI, device description, identifiers and attributes	A14.3	100 (0)	11 (11)	24 (13)	24 (10)	0 (0)	5 (0)
32. Incorporate a CCDA	B2.1	100 (0)	51 (55)	96 (27)	96 (60)	0 (0)	4.9 (0.3)
33. Generate a new CCDA with reconciled data.	B2.2	100 (0)	44 (44)	39 (18)	39 (30)	0 (0)	5 (0)
34. Enter Medication Orders and e-Prescribe	B3.1	100 (0)	44 (44)	96 (40)	96 (90)	0 (0)	5 (0)
35. Cancel and Change prescription (dosage or duration)	B3.2	91 (30)	22 (22)	111 (46)	111 (90)	0.09 (0.3)	5 (0)
36. Refill Prescription	B3.3	100 (0)	33 (33)	76 (47)	76 (45)	0 (0)	5 (0)
37. Receive fill status notification	B3.4	100 (0)	22 (22)	58 (33)	58 (45)	0 (0)	5 (0)
38. Request and receive medication history information	B3.5	100 (0)	44 (44)	63 (22)	64 (60)	0 (0)	5 (0)

4.9.3 Effectiveness

Task Success: Overall 38 tasks were selected and executed by 11 participants. The total number of tasks for sampling is 418.

Total # of tasks	418
Number of tasks unable to be completed	5
Total # of tasks completed	413

Therefore: the effectiveness percentage is 99.78%.

Task Failures: Out of 418 tasks, 5 tasks were recorded as failures. Testers were unable to complete these tasks without error's. Therefore; the failure percentage is 0.22%.

Task that were not completed during testing were due to script errors by the administrator and not properly resetting before running a participant through.

4.9.4 Efficiency

Task deviations and task times were computed.

Task deviations: The task deviation optimal total across all the measures was 13,189 seconds and the task deviation observed total was 13,290 seconds. Therefore; this indicated a low level of deviation of 1%.

Task Times: The task time mean across all the measures was 24,695 seconds. The task time standard deviation across all the measures was 10,494 seconds. Therefore; this indicated a low level of deviation of 2.35%

User Satisfaction

The post task rating average for all the 418 tasks was reported at a mean of 4.98 with a standard deviation of 0.02 indicating a high level of user satisfaction.

The posttest session usability questionnaire has reported a positive user experience.

Ranking of 1 for Strongly Disagree/Ranking of 5 for Strongly Agree	001	002	003	004	005	006	007	008	009	010	011
1. I think I would like to use this system frequently	5	5	5	5	5	5	5	5	5	5	5
2. I found the system unnecessarily complex	1	1	1	5	1	1	5	1	1	1	1
3. I thought the system was easy to use	5	5	5	5	5	5	5	5	5	5	5
4. I think I would need the support of a technical person to be able to use this system	1	1	1	1	4	1	1	1	1	1	3
5. I found the various functions in the system were well integrated	5	4	5	5	5	5	5	5	5	5	5
6. I thought there was too much inconsistency in the system	1	1	1	1	1	1	1	1	1	1	2
7. I would imagine that most of the users would learn to use this system very quickly	5	5	5	5	5	5	5	5	5	5	5
8. I found the system very cumbersome to use	5	1	1	1	1	1	1	1	1	1	1
9. I felt very confident using the system	5	5	5	5	5	5	5	5	5	5	4
10. I needed to learn a lot of things before I could get going with the system.	1	1	1	1	3	1	1	1	1	1	2

Some of the positive responses:

- The UI Design is very simple and intuitive to use.
- They had positive things to say about the new Stage 3 features.
- All the testers believed that they could use the system with very little training or technical support.

4.9.5 Major Findings

i. Bug 1: was discovered on the last day and last person. Newly sent prescriptions were not appearing in the e-Rx history.
ii. Bug 2: was found in the Implantable Device screen. The “Cancel” button was not working. The user was still able to “X” out of the screen.

iii. Bug 3: was discovered early during testing. When the user clicked on e-Rx button, they were brought into the Allergies section of the e-Rx.
iv. Effectiveness Measures:
    - Successful tasks (percentage of tasks completed within time, without help and without error) was reported at 99.78%.
    - Number of errors: 5.
v. Efficiency:
    - Average time for task completion is 59.00 seconds and standard deviation is 24.37 seconds.
vi. Learn ability: It was observed that the testers were able to increase the speed of operations as the test progressed.

4.9.6 Areas of improvement

i. Updating the status of the implantable device. Users had trouble identifying that they needed to select the word “Implanted.”
ii. Users would like to have the patient’s clinic and physician already defaulted to minimize their clicks.
iii. Lag time from when a medication was prescribed and the time that elapsed for the medication to appear in the patient’s e-rx status.

5 Appendix

A	Moderators Guide	
B	Informed consent form	
C	Non-Disclosure Agreement	
D	Participant Orientation	
E	Participant Questionnaire (Appendix G)	
F	Post Test Questionnaire (H)	
G	Acknowledgment of Gift Certificate (Appendix I)	