

EHR Usability Test Report of AdvancedMD Version 12.5

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

AdvancedMD Version 12.5

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EXECUTIVE SUMMARY

A usability test of AdvancedMD AdvancedEHR was conducted between June 4th and June 15th 2018 in South Jordan Utah via a real-time screen sharing application with participants joining from their own various locations, by Trent Peterson a user experience analyst and designer employed by AdvancedMD . The purpose of this test was to assess and validate the usability of the current user interface, and provide evidence of usability in the EHR Under Test (EHRUT). During the usability test, two groups of participants totaling 25 clinical 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 44 tasks typically conducted using an EHR:

Table: Tasks and Certification Criteria

Task	Task Description	Criteria
1	Record problem	170.315 (a)(6)
1.1	Trigger, attend and interpret CDS interventions for problem list, vitals, demographic information, then locate suggested therapeutic/diagnostic resources.	170.315 (a)(9)
2	Record medication allergy	170.315 (a)(8)
2.1	Trigger CDS intervention for drug-allergy interaction.	170.315 (a)(9)
3	Modify medication allergy	170.315 (a)(8)
4	Review Active / Inactive medication allergies.	170.315 (a)(8)
5	Record medication via CPOE	170.315 (a)(7)
6	Modify medication via CPOE	170.315 (a)(7)
7	Record medication via CPOE	170.315 (a)(7)
7.1	Display drug-drug contraindication intervention(s) based on the patient's medication list prior to completing the order.	170.315 (a)(4)
7.2	Trigger, attend and interpret CDS intervention for drug-allergy interaction, and access information.	170.315 (a)(9)
8	Record medication	170.315 (a)(7)
9	Create lab order	170.315 (a)(2)
10	Modify lab order	170.315 (a)(2)
11	Create imaging order	170.315 (a)(3)
12	Modify imaging order	170.315 (a)(3)
13	Record problem	170.315 (a)(6)
13.1	Trigger, attend and interpret CDS intervention for problem, and access information.	170.315 (a)(9)
14	Modify problem	170.315 (a)(6)
15	Review Active / Historical problems	170.315 (a)(6)
16	Prescribe medication	170.315 (a)(1)
16.1	Trigger, attend and interpret CDS intervention for drug, then locate suggested therapeutic/diagnostic resources.	170.315 (a)(9)
17	Modify prescription	170.315 (a)(1)

18	Make medication historical	170.315 (a)(1)
19	Review Current / Historical medications	170.315 (a)(1)
20	Search and Select Patient	---
20.1	Trigger, attend and interpret CDS intervention for Age/Gender	170.315 (a)(9)
20.2	Trigger, attend and interpret CDS intervention for lab returns	170.315 (a)(9)
21	Record Vitals	---
21.1	Trigger, attend and interpret CDS intervention for vitals	170.315 (a)(9)
22	Receive CCDA (find and open)	170.315 (b)(2)
23	Import CCDA and reconcile medications, medication allergies, and problems list.	170.315 (b)(2)
23.1	Trigger, attend and interpret CDS intervention for summary of care.	170.315 (b)(2)
24	Generate and send CCDA with medications, medication allergies, and problems list.	170.315 (b)(2)
25	Record implanted device	170.315 (a)(14)
26	Modify implanted device	170.315 (a)(14)
27	Review implanted devices	170.315 (a)(14)
28	Change active implanted device to inactive	170.315 (a)(14)
29	Review (filter) active/inactive implanted devices	170.315 (a)(14)
30	Record patient demographics	170.315 (a)(5)
31	Modify patient demographics	170.315 (a)(5)
32	Create new ePrescribed liquid medication (metric only)	170.315 (b)(3)
33	Cancel ePrescribed medication and view cancellation response	170.315 (b)(3)
34	Review and approve eRefill medication request, deny refill renewal, approve and allow refills.	170.315 (b)(3)
35	Review and respond to pharmacy change request: Approve/Deny a Therapeutic Change	170.315 (b)(3)
36	Review and respond to pharmacy change request: Approve/Deny a Generic Change	170.315 (b)(3)
37	Review and respond to pharmacy change request: Approve/Deny Prior Authorization.	170.315 (b)(3)
38	Receive fill status notification	170.315 (b)(3)
39	Request and receive medication history information	170.315 (b)(3)
40	Adjust the severity level of CDS interventions for drug-drug interaction checks	170.315 (a)(4)

**** Tasks 20 and 21 were included in the test as prerequisite user actions to their follow-on tasks 20.1 and 21.1, and were not in themselves connected to certification criterion.**

During the 90 minute (60 minute for Group B, 15 minute for Group C) one-on-one usability test, each participant was greeted by the administrator and asked to review and sign an informed consent/release form (included in Appendix 2); they were instructed that they could withdraw at any time. Participants had prior experience with the EHR, but not with the version of the EHR being tested. Users were provided a three minute training session prior to the test session. The training materials, in the form of a short scripted demo, introduced the concept of patient cards as a fundamental UI construct within the patient chart UI panel. Each patient card contains a list consisting of a specific item type from the patient chart (e.g. Problems, Medications, Allergies, Orders, etc.)

The administrator introduced the test, and instructed participants to complete a series of tasks using the EHRUT. During the testing, the administrator timed the test and, along with the data logger recorded user performance data electronically. The administrator did not give the participant assistance in how to complete the task. Participant screens, and audio were recorded for subsequent analysis.

The following types of data were collected for each participant:

- The number of tasks successfully completed within the allotted time without assistance.
- Time to complete the tasks
- Number and type of errors
- Path deviations
- Participant verbalizations
- Participant satisfaction ratings for each task and for 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 and were compensated with a \$50 gift certificate for their time (except for group C which were not compensated for their time). 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 with tasks grouped by certification criteria and averaged within each group. (For a task by task breakdown of the data, see the Section 4.1 DATA ANALYSIS AND REPORTING).

Table: Results Overview

Task Category	Success (%)		Errors	Deviations	Task Rating	Tasks
	Total	Within Target	Mean	Mean	Mean	
170.315 (a)(1)	88	65	0	0.21	4.05	16, 17, 18, 19
170.315 (a)(2)	100	84	0	0.3	4.2	9, 10
170.315 (a)(3)	93	80	0	0.36	3.9	11, 12
170.315 (a)(4)	92	92	0	0.17	3.8	7.1, 40
170.315 (a)(5)	100	90	0	0	4.2	30, 31
170.315 (a)(6)	97	80	0	0.23	4.08	1, 13, 14, 15
170.315 (a)(7)	85	42	0.02	0.16	3.88	5, 6, 7, 8
170.315 (a)(8)	93	51	0	0.18	4.13	2, 3, 4
170.315 (a)(9)	88	72	0.02	0.05	4.24	1.1, 2.1, 7.2, 13.1, 16.1, 20.1, 20.2, 21.1, 23.1
170.315 (a)(14)	95	83	0	0.14	4.22	25, 26, 27, 28, 29
170.315 (b)(2)	72	57	0	0.34	3.13	22, 23, 24

170.315 (b)(3)	80	70	0	0.44	3.83	32, 33, 34, 35, 36, 37, 38, 39
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The results from the System Usability Scale (SUS) scored the subjective satisfaction with the system based on performance with these tasks to be 75.1. A SUS score of 68 is considered average.

In addition to the performance data, the following qualitative observations were made (see section 4.3.5 for a full list and more in depth discussion of MAJOR FINDINGS):

MAJOR FINDINGS

- Navigation using Patient Cards was problematic, especially when the cards were collapsed in a column on the left, showing only the top of each card.
- Inconsistencies in the placement and function of icons and buttons caused confusion.
- Outdated components and inconsistent user interactions were a source of confusion and error.
- Task 23 - 'Import CCDA and reconcile medications, medication allergies, and problems list' gave participants the most difficulty, however it is considered as low risk task.
- The calculation of prescriptions for dosage, instructions, length of prescription etc. being absent from the application (as participants attempted to enter the medication) had a definite and obvious negative impact on time required to complete the task.

AREAS FOR IMPROVEMENT

- Redesign left column navigation so that all navigation options are immediately available "above the fold" i.e. without the need to scroll.
- Make placement of important functional invocation points consistent across all pages e.g. filter, save, delete, etc.
- Improve system feedback for system status, e.g. saved / not saved.
- Improve support for dosage calculation and do not require an order of data entry to use dosage calculation support.
- Enhance searches to handle data return on "like data" for misspelling and add filters to allow users to limit results.

INTRODUCTION

The EHRUT tested for this study was AdvancedMD AdvancedEHR version 12.5. Designed to present medical information to healthcare providers in ambulatory care setting, the EHRUT consists of features that include but are not limited to:

- Patient demographics
- Patient problem, medication and medication allergy lists
- Patient encounter chart notes
- Patient clinical summary documents
- Lab order creation (sending & results may be printed and entered manually, or using an HL7)
- Growth Charting
- Immunization recording
- Electronic Prescribing
- Drug-drug, drug-allergy, and drug-problem interaction checking
- Clinical Quality reporting
- Patient population reporting
- Clinical Decision Support and patient condition monitoring (HealthWatcher)

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, such as successful task completion rate, time on task, number and types of errors, and participant perception of learnability, and satisfaction were captured during the usability testing.

METHOD

3.1 PARTICIPANTS

A total of 35 participants were recruited for the test. Because of the number of tasks that the participants were asked to complete during the test, and the length of time required to complete all of the tasks, participants were initially divided into two groups and each group was assigned a portion of the tasks to complete. The first group (Group A) included 15 participants and were asked to complete tasks 1 - 31. The second group (Group B) included 10 participants who were asked to complete tasks 32 - 37. A third group of participants (Group C) was later added in order to complete testing on three remaining tasks.

Participants in the test were Physicians and Clinical Staff members including Physicians Assistants, Nurses, and other clinical assistants who are normally responsible for data entry during a patient visit. Three Office Managers with significant clinical experience also participated. Participants were recruited by AdvancedMD Employees and were compensated with a \$50 gift certificate for their time. In addition, participants had no direct connection to AdvancedMD. Participants were given the opportunity to have the same orientation and level of training as the actual end users would have received. For the test purposes, end-user characteristics

were identified and translated into a recruitment screener used to solicit potential participants; an example of a screener is provided in APPENDIX 1: Sample Recruiting Screener.

Recruited participants had a mix of backgrounds and demographic characteristics conforming to the recruitment screener. The following is a table of participants by characteristics, including demographics, professional experience, computing experience. Participant names were replaced with Participant IDs so that an individual's data cannot be tied back to individual identities.

Table: Participant Demographics.

ID	Group	Gender	Age	Occupation / Role	Professional Experience	Computer Experience	AdvancedMD Experience
1	A	F	20-29	Clinical Staff	4	4	4
2	A	F	40-49	Office Staff	29	6	1
3	A	F	30-39	Office Manager	15	5	1
4	A	F	50-59	Physician	30	11	1
5	A	M	30-39	Physician	7	6	4
6	A	M	30-59	Physician	30	10	8
7	A	F	20-29	Clinical Staff	5	5	1
8	A	F	50-59	Physician	8	5	1
9	A	F	40-49	Clinical Staff	20	15	3
10	A	F	30-39	Office Manager	16	10	1
11	A	F	20-29	Clinical Staff	3	5	2
12	A	F	50-59	Office Manager	29	10	9
13	A	M	30-39	Clinical Staff	20	20	7
14	A	M	40-49	Physician	16	17	13
15	A	F	50-59	Clinical Staff	7	7	1
16	B	F	40-49	Physician	16	20	1
17	B	F	30-39	Clinical Staff	10	10	1
18	B	M	40-49	Physician	11	11	6
19	B	F	40-49	Clinical Staff	10	10	1
20	B	F	40-49	Physician	14	15	10
21	B	M	40-49	Clinical Staff	12	13	6
22	B	M	40-49	Physician	17	20	10
23	B	M	40-49	Physician	20	20	10
24	B	F	20-29	Clinical Staff	6	7	4
25	B	M	30-39	Physician	24	13	1
26	C	M	60 - 69	Clinical Staff	4	20	2

27	C	M	61 - 69	Provider	34	26	1
28	C	M	30 - 39	Clinical Staff	3	10	2
29	C	M	50 - 59	Clinical Staff	30	35	1
30	C	F	30 - 39	Office Staff	19	19	15
31	C	F	30 - 39	Office Staff	10	25	3
32	C	F	40 - 49	Clinical Staff	12	16	1
33	C	F	30 - 39	Clinical Staff	10	10	1
34	C	F	50 - 59	Office Staff	24	32	13
35	C	F	41-50	Clinical Staff	9	25	2

Note: None of the participants required assistive technologies.

Participants in group A were scheduled for 90 minute sessions, those in group B were scheduled for 60 minute sessions, and those in group C for 15 minute sessions.

3.2 STUDY DESIGN

Overall, the objective of this test was to uncover areas where the application performed well – that is, effectively, efficiently, and with high 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 the EHRUT for all tasks except those having to do with Demographics (tasks 30 and 31) for which they were required to use AdvancedMD's AdvancedPM application. Each participant used the system in their preferred location and were monitored and recorded remotely using GoToMeeting conferencing software. Each participant in the two groups was provided with the same tasks and instructions as others in their group. The system was evaluated for effectiveness, efficiency, learnability, and satisfaction as defined by measures collected and analyzed for each participant:

- The number of tasks successfully completed within the allotted time without assistance.
- Time to complete the tasks successfully.
- Number of errors
- Path deviations
- Participant's verbalizations
- Participant's ratings of task difficulty
- Participant satisfaction ratings for the system

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

3.3 TASKS

A number of tasks were constructed that would be realistic and representative of the kinds of activities a user might do with the EHRUT.

A risk level category was assigned to each task prior to the test based on an assessment of risk involved in the task. 'Risk' was operationally defined for the purposes of this test as "The potential for negative patient outcomes due to 1. the inability of a user to complete the task, 2. the inability of a user to complete the task in a timely manner, 3. the inability of a user to complete the task without major errors." A discussion of the test results in relation to this risk assessment follows (see section 4.3.4 Risk Evaluation).

The tasks, their certification criteria category, and the assigned risk level category are specified below:

Table: Tasks and Related Certification Criteria and Risk Level Category.

Task	Task Description	Criteria	Risk
1	Record problem	170.315 (a)(6)	High
1.1	Trigger, attend and interpret CDS interventions for problem list, vitals, demographic information, then location suggested therapeutic/diagnostic resources.	170.315 (a)(9)	High
2	Record medication allergy	170.315 (a)(8)	High
2.1	Trigger CDS intervention for drug-allergy interaction.	170.315 (a)(9)	High
3	Modify medication allergy	170.315 (a)(8)	Medium
4	Review Active / Inactive medication allergies.	170.315 (a)(8)	Low
5	Record medication via CPOE	170.315 (a)(7)	High
6	Modify medication via CPOE	170.315 (a)(7)	Medium
7	Record medication via CPOE	170.315 (a)(7)	High
7.1	Display drug-drug contraindication intervention(s) based on the patient's medication list prior to completing the order.	170.315 (a)(4)	High
7.2	Trigger, attend and interpret CDS intervention for meds, and access and share med information with the patient.	170.315 (a)(9)	High
8	Record medication	170.315 (a)(7)	High
9	Create lab order	170.315 (a)(2)	Medium
10	Modify lab order	170.315 (a)(2)	Low
11	Create imaging order	170.315 (a)(3)	Medium
12	Modify imaging order	170.315 (a)(3)	Medium
13	Record problem	170.315 (a)(6)	High
13.1	Trigger, attend and interpret CDS intervention for problem, and access information.	170.315 (a)(9)	High

14	Modify problem	170.315 (a)(6)	Medium
15	Review Active / Historical problems	170.315 (a)(6)	Low
16	Prescribe medication	170.315 (a)(1)	High
16.1	Trigger, attend and interpret CDS intervention for drug, then location suggested therapeutic/diagnostic resources.	170.315 (a)(9)	High
17	Modify prescription	170.315 (a)(1)	Medium
18	Make medication historical	170.315 (a)(1)	Low
19	Review Current / Historical medications	170.315 (a)(1)	Low
20	Search and Select Patient	---	---
20.1	Trigger, attend and interpret CDS intervention for Age/Gender	170.315 (a)(9)	High
20.2	Trigger, attend and interpret CDS intervention for lab returns	170.315 (a)(9)	High
21	Record Vitals	---	---
21.1	Trigger, attend and interpret CDS intervention for vitals	170.315 (a)(9)	High
22	Receive CCDA (find and open)	170.315 (b)(2)	Low
23	Import CCDA and reconcile medications, medication allergies, and problems list.	170.315 (b)(2)	Medium
23.1	Trigger, attend and interpret CDS intervention for summary of care.	170.315 (a)(9)	Medium
24	Generate and send CCDA with medications, medication allergies, and problems list.	170.315 (b)(2)	Low
25	Record implanted device	170.315 (a)(14)	Medium
26	Modify implanted device	170.315 (a)(14)	Low
27	Review implanted devices	170.315 (a)(14)	Low
28	Change active implanted device to inactive	170.315 (a)(14)	Low
29	Review (filter) active/inactive implanted devices	170.315 (a)(14)	Low
30	Record patient demographics	170.315 (a)(5)	Low
31	Modify patient demographics	170.315 (a)(5)	Low
32	Create new ePrescribed liquid medication (metric only)	170.315 (b)(3)	High
33	Cancel ePrescribed medication and view cancellation response	170.315 (b)(3)	High
34	Review and approve eRefill medication request, deny refill renewal, approve and allow refills.	170.315 (b)(3)	High
35	Review and respond to pharmacy change request: Approve/Deny a Therapeutic Change	170.315 (b)(3)	High
36	Review and respond to pharmacy change request: Approve/Deny a Generic Change	170.315 (b)(3)	High
37	Review and respond to pharmacy change request: Approve/Deny Prior Authorization.	170.315 (b)(3)	High
38	Receive fill status notification	170.315 (b)(3)	Low
39	Request and receive medication history information	170.315 (b)(3)	Low
40	Adjust the severity level of CDS interventions for drug-drug interaction checks	170.315 (a)(4)	Low

Participants in Group A were asked to complete tasks 1 through 31 (totaling 38 tasks in all, due to the fact that some tasks were assigned point designations e.g. tasks 1.1, 2.1, 7.1 etc.) Participants in Group B

were asked to complete tasks 32 through 37 (6 tasks in all). Participants in Group C were asked to complete tasks 38, 39 and 40.

The full text of each task is included in APPENDIX 5: Test Questions / Tasks.

3.4 PROCEDURES

After the participants were scheduled, they were sent a confirmation email with the testing date and time, as well as a link for joining the scheduled GoToMeeting session.

At the start of each test session, the administrator greeted the participant as he/she joined the GoToMeeting session and informed the participant of who was in the room and observing the session.

The participant was then directed to read and sign an online form which contained a statement of Informed consent for participating in the usability test, and consent to record the test session (See APPENDIX 2).

After gaining participant consent, the administrator started recording the session.

To ensure that the test ran smoothly, two staff members participated in this test, the usability test administrator and a data logger. The usability test administrator conducting the test was an experienced usability practitioner with 18 years of experience in user experience design and usability evaluation, and a Ph. D. in a related field.

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 task success, path deviations, and the number and type of errors. A second person served as the data logger and took notes on the participant's verbalizations.

The administrator gave the participants the following instructions regarding the test:

- Read each task out loud when directed.
- Complete each task as quickly as possible while making as few errors and deviations as possible.
- The test administrator will not answer questions about how to complete the task, but may answer questions to clarify the tasks.
- Say "Finished" when you have successfully completed each task.
- Rate the difficulty of completing each task on the 5 point scale that is provided.

Participants were then instructed to login to the EHRUT using credentials provided by the test administrator.

For each task, the participant was given a written copy of the task. Task timing began once the participant finished reading the question. The task time was stopped once the participant indicated they had successfully completed the task.

Following the test session, the administrator gave the participant the post-test questionnaire thanked each individual for their participation and compensated them for their time.

Participants' task success rate, time on task, errors, deviations, pertinent verbalizations and post-test questionnaire responses were recorded into a spreadsheet for compilation and analysis.

3.5 TEST LOCATION

The test was conducted remotely with the use of the screen sharing feature in the video conferencing software GoToMeeting, thus the actual test location was at the discretion of the test participants. The test administrator, staff observers and data loggers, were together in the South Jordan, UT AdvancedMD Software corporate office.

3.6 TEST ENVIRONMENT

The EHRUT would typically be used on a desktop or mobile device in the healthcare office or facility, either to document patient encounters during the encounter or for post-encounter documentation.

For testing, the participant chose a testing location and were not instructed as to what device should or should not be used for testing, neither was this information obtained from the participant.

The administrator set up the data within the EHRUT prior to each test session. The data consisted of fabricated data representative of real patient data that allowed for the completion of the specified tasks. The system was set up with the usual default settings and user preferences.

The application is a cloud-based SAAS (Software as a Service) application, and was running in a production environment, though with fabricated data. The performance (i.e response time) of the system was representative to what users would experience in a field implementation.

3.7 TEST FORMS AND TOOLS

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

- Informed Consent / Release Form
- Background and Demographics Questionnaire
- Test Instructions
- Test Questions / Tasks
- System Usability Survey (SUS) questionnaire.

Examples of these documents can be found in APPENDICES 2–6.

Participants' interactions with the EHRUT were captured and recorded using the screen recording capability of the GoToMeeting software. A spreadsheet was used to capture task times, path deviations and errors.

3.8 PARTICIPANT INSTRUCTIONS

The Administrator reads the following instructions aloud to each participant.

“Thank you for volunteering to participate in our usability study today. Your input is very important to AdvancedMD.

Today’s session is a test of our EHR, how easy or how difficult it is to use. It is not a test of you or your skills or abilities. So, If some tasks seems more difficult, remember it is the fault of the system, and it is the purpose of this test to identify those faults.

I am going to give you a series of tasks to complete. You may ask me questions during the test, however, I may be unable to answer all of them.

Examples of questions I can answer are spelling of names, medications, conditions etc., clarification of task instructions, to repeat things that I have said, or you may ask me to provide ICD codes if that it helpful to you.

An example of questions I cannot answer are “what should I click?” or “where should I go to find this?”

Do you have any questions about these instructions before we begin?”

Following these verbal instructions, the participant was given written Test Instructions (APPENDIX 4)

3.9 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 and efficiently, with an acceptable level of satisfaction. Metrics for effectiveness, efficiency, and satisfaction were captured during the usability testing. The goals were to assess:

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

Data Scoring

The following table (Table [x]) details how tasks were scored, errors evaluated, and the time data analyzed.¹⁰

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. Successes were then further divided for analysis as whether or not it was completed within the time allotted (*) on a per task basis.</p> <p><i>(*) In the time calculation, administrators took into account irrelevant time spent correcting user typos (as repeated typing mistakes are not considered a UX issue) and time spent by some participants pausing the task to try to comment right away on the feature; even though instructed not to, some participants eager to share comments would sometimes forget this instruction and needed to be reminded to wait until after the task to share their thoughts.</i></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 only.</p> <p>Optimal task performance time under realistic conditions is estimated and recorded when constructing tasks. Target task times are operationally defined by taking measures of optimal performance and multiplying by a factor (1.25 for 60+ second tasks and 1.5 for less than 60 second tasks to allow a buffer because the participants are presumably not trained to expert performance). For instance, if expert optimal performance for a task is 120 seconds, adjusted target task time is 150 (120 x 1.25) seconds and if optimal performance for a task is 10 seconds, adjusted target task time is 15 (10 x 1.5) seconds.</p>
Effectiveness Task Failures	<p>If the participant abandoned the task, did not reach the correct answer or performed it incorrectly, the task was counted as a “Failure.” No task times were taken for errors.</p> <p>The total number of errors, average and standard deviation were calculated for each task. Not all deviations would be counted as errors.</p>

Efficiency Task Time	<p>The participant's path (i.e., steps) through the application was recorded. A deviation is recorded 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.</p> <p>A deviation is qualified as minor, for instance:</p> <ul style="list-style-type: none"> ● If the path followed leads to a success without errors but requires more steps. ● If the user notices after the step that it is not the right path and returns easily to the previous step and is able to continue and return on the optimal path without patient safety concerns. ● In all cases, a deviation can only be minor if there are no errors, if patient safety is not compromised or if user shows awareness that he/she requires making a correction to pursue the task. <p>A deviation is qualified as major, for instance:</p> <ul style="list-style-type: none"> ● If the participant cannot return to the optimal path and/or cannot complete the task. ● If the participant believes he/she completed the task successfully but did not. ● If through the workflow, data captured or not captured could potentially affect patient safety. <p>Typically, a major deviation would lead to documentation of an error for the task, unless users realizes the error and makes the required correction so no patient safety issues result once task is completed.</p> <p>Optimal paths (i.e. steps) were recorded when constructing tasks and task deviations are reported. The total number of deviations, average and standard deviation were calculated for each task.</p>
Efficiency Task Time	<p>Each task is timed from when the administrator said "Begin" until the participant indicates they are "Done" whether they have completed the task, think they have completed the task or abandon the task. The time is then stopped.</p> <p>Only task times for tasks that are successfully completed are included in the average task time analysis. Average time per task is calculated for each task.</p> <p>Variance measures (weighted average and standard deviation) are also calculated.</p>
Satisfaction Task Rating	<p>Participant's subjective impression of the ease of use of the application is measured by asking the participant after each task to rate the task "Overall" from 1 (very difficult) to 5 (Very Easy). These data are averaged across participants. 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 Hello Health overall, participants are also asked to complete 2 post-test questionnaires (Final questions and System Usability Scale).</p>

RESULTS

4.1 DATA ANALYSIS AND REPORTING

The usability testing results are detailed in the tables below. The results should be seen in light of the objectives and goals outlined in the Study Design section. The data should yield actionable results that, if corrected, yield material, positive impact on user performance.

The results of the usability test were calculated according to the methods specified in the Usability Metrics section above. Failures, deviations and errors are commented as annotations.

Table: Results Summary

Task	N	Success	Success within Target	Errors		Path Deviations		Task Time *		Task ** Rating
		# / (%)	# / (%)	#	Mean (SD)	#	Mean (SD)	Mean (SD)	Target	Mean
1	15	15 (100)	11 (73)	0	0 (0)	2	0.13 (0.52)	152.27 (87.18)	169	3.9
1.1	15	11 (73)	11 (73)	4	0.27 (0.46)	0	0 (0)	7.4 (7.38)	75	3.9
2	15	15 (100)	12 (80)	0	0 (0)	2	0.13 (0.35)	46.2 (33.99)	60	4.3
2.1	15	14 (93)	11 (73)	1	0.07 (0.26)	0	0 (0)	17.8 (23.5)	45	4.1
3	15	15 (100)	9 (60)	0	0 (0)	1	0.07 (0.26)	31.07 (19.16)	30	4.6
4	15	12 (80)	2 (13)	2	0.13 (0.35)	4	0.27 (0.46)	40.33 (32.21)	15	3.5
5	15	8 (53)	2 (13)	6	0.4 (0.51)	2	0.13 (0.35)	46.67 (35.27)	60	3.7
6	15	14 (93)	1 (7)	0	0 (0)	4	0.27 (0.46)	97.07 (84.08)	23	3.7
7	15	14 (93)	7 (47)	2	0.13 (0.35)	1	0.07 (0.26)	56 (32.27)	60	3.8
7.1	15	14 (93)	14 (93)	1	0.07 (0.26)	0	0 (0)	5.07 (3.08)	45	4.3
7.2	15	14 (93)	14 (93)	1	0.07 (0.26)	0	0 (0)	5.07 (3.08)	45	4.3
8	15	15 (100)	15 (100)	0	0 (0)	2	0.13 (0.35)	45.93 (23.69)	125	4.3
9	15	15 (100)	13 (87)	0	0 (0)	4	0.27 (0.46)	49.73 (32.5)	75	4.1
10	15	15 (100)	12 (80)	0	0 (0)	5	0.33 (0.62)	53.33 (76.19)	75	4.3
11	15	14 (93)	10 (67)	1	0.07 (0.26)	8	0.53 (0.83)	63.33 (54.04)	94	3.7
12	15	14 (93)	14 (93)	1	0.07 (0.26)	3	0.2 (0.41)	16.27 (14.32)	68	4.1
13	15	13 (87)	10 (67)	2	0.13 (0.35)	11	0.73 (0.59)	86.47 (47.04)	119	3.4
13.1	15	15 (100)	7 (47)	0	0 (0)	3	0.2 (0.41)	58.47 (45.53)	45	3.5
14	15	15 (100)	12 (80)	0	0 (0)	0	0 (0)	41.6 (58.75)	75	4.4
15	15	15 (100)	15 (100)	0	0 (0)	0	0 (0)	10.47 (10.83)	75	4.6
16	15	15 (100)	13 (87)	0	0 (0)	0	0 (0)	85 (37.66)	138	4.5
16.1	15	14 (93)	12 (80)	1	0.07 (0.26)	4	0.27 (0.46)	22 (31.79)	45	4.6

17	15	15 (100)	11 (73)	0	0 (0)	2	0.13 (0.35)	67.4 (53.79)	75	3.6
18	15	12 (80)	7 (47)	3	0.2 (0.41)	7	0.47 (0.64)	60.6 (88.24)	75	4.2
19	15	11 (73)	8 (53)	4	0.27 (0.46)	4	0.27 (0.46)	29.33 (34.45)	45	3.9
20	14	14 (100)	14 (100)	0	0 (0)	0	0 (0)	5.93 (3.29)	23	4.7
20.1	14	14 (100)	14 (100)	0	0 (0)	0	0 (0)	11.71 (8.53)	45	4.8
20.2	14	14 (100)	14 (100)	0	0 (0)	0	0 (0)	11.71 (8.53)	45	4.8
21	14	14 (100)	11 (79)	0	0 (0)	0	0 (0)	52.64 (28.67)	75	4.1
21.1	14	14 (100)	5 (36)	0	0 (0)	0	0 (0)	46.79 (26.33)	45	4.2
22	14	11 (79)	8 (57)	3	0.2 (0.41)	6	0.4 (0.91)	41.79 (48.01)	75	3.1
23	14	6 (43)	4 (29)	7	0.47 (0.52)	9	0.6 (0.74)	81.36 (119.87)	250	3.2
23.1	14	6 (43)	6 (43)	9	0.6 (0.51)	0	0 (0)	3.93 (5.37)	45	4
24	14	13 (93)	12 (86)	1	0.07 (0.26)	0	0 (0)	138.21 (66.04)	250	3.1
25	12	11 (92)	8 (67)	1	0.07 (0.26)	4	0.27 (0.46)	157.25 (118.26)	238	3.9
26	12	12 (100)	11 (92)	0	0 (0)	1	0.07 (0.26)	19.42 (16)	38	4.3
27	12	12 (100)	12 (100)	0	0 (0)	0	0 (0)	10.33 (8.72)	38	4.6
28	12	11 (92)	10 (83)	1	0.07 (0.26)	1	0.07 (0.26)	11.83 (8.09)	23	4.3
29	12	11 (92)	9 (75)	1	0.07 (0.26)	2	0.13 (0.35)	17.75 (22.63)	38	4
30	15	15 (100)	12 (80)	0	0 (0)	0	0 (0)	168 (88.99)	250	4
31	15	15 (100)	15 (100)	0	0 (0)	0	0 (0)	26.6 (19.51)	75	4.4
32	10	6 (60)	0 (0)	3	0.4 (0.52)	2	0.2 (0.42)	72.2 (14.76)	100	4.4
33	10	4 (40)	2 (20)	0	0.4 (0.52)	4	0.4 (0.52)	34.8 (25.4)	75	2
34	10	10 (100)	8 (80)	0	0 (0)	6	0.6 (0.52)	57 (17.68)	75	4.9
35	10	10 (100)	10 (100)	0	0 (0)	0	0 (0)	29 (4.67)	60	4.2
36	10	10 (100)	7 (70)	0	0 (0)	0	0 (0)	36 (25.74)	60	4.6
37	10	10 (100)	8 (80)	0	0 (0)	0	0 (0)	39.4 (43.57)	60	4.5
38	10	7 (70)	7 (70)	3	0.3 (0.48)	3	0.3 (0.48)	69.1 (60.35)	250	2.9
39	10	7 (70)	7 (70)	3	0.3 (0.48)	17	1.7 (1.06)	67.5 (50.9)	250	3.1
40	10	9 (90)	9 (90)	1	0.1 (0.32)	4	0.4 (0.7)	61.2 (34.21)	250	3.3

* Task times are reported in seconds.

** 5 = Very Easy, 1 = Very Difficult

Note: Tasks 20 and 21 were included in the test as prerequisite user actions to their follow-on tasks 20.1 and 21.1, and were not in themselves connected to certification criterion.

The results from the System Usability Scale (SUS) scored the subjective satisfaction with the system based on performance with these tasks to be 76.35 overall, 71.5 for tasks 1 to 31 (Participant Group A), and 84.4 for tasks 32 to 37 (Participant Group B).

Task: 1 - Record problem

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	112	4	
2	Y	0	0	123	4	
3	Y	0	0	152	5	
4	Y	0	0	60	3	
5	Y	0	0	155	4	
6	Y	0	2	204	1	#1
7	Y	0	0	194	4	
8	Y	0	0	344	5	
9	Y	0	0	81	5	
10	Y	0	0	103	3	
11	Y	0	0	87	4	
12	Y	0	0	129	4	
13	Y	0	0	134	5	
14	Y	0	0	68	4	
15	Y	0	0	338	3	
<i>N: 15</i>	Σ Success: 15	Σ : 0 x: 0	Σ : 2 x: 0.13	x: 152.27	x: 3.87	

#1 - Participant had difficulty invoking the patient chart.

Task: 1.1 - Trigger, attend and interpret CDS interventions for problem list, vitals, demographic information, then locate suggested therapeutic/diagnostic resources.

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	4	4	
2	Y	0	0	9	4	
3	Y	0	0	7	5	
4	Y	0	0	6	3	
5	Y	0	0	5	4	
6	Y	0	0	10	1	
7	Y	0	0	8	4	
8	N	1	0	---	5	#1
9	Y	0	0	8	5	
10	N	1	0	---	3	#1
11	Y	0	0	13	4	
12	N	1	0	---	4	#1
13	Y	0	0	10	4	
14	N	1	0	---	4	
15	Y	0	0	31	4	
<i>N: 15</i>	<i>Σ Success: 11</i>	<i>Σ: 4</i> <i>x: 0.27</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>x: 10.09</i>	<i>x: 3.87</i>	

#1 - Participant closed pop-up before reading and processing it's content, and were unable to describe the content when asked.

Task: 2 - Record medication allergy

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	56	4	
2	Y	0	0	19	4	
3	Y	0	0	27	5	
4	Y	0	0	53	3	
5	Y	0	1	138	2	#1
6	Y	0	0	60	4	
7	Y	0	0	37	5	
8	Y	0	0	24	5	
9	Y	0	0	20	5	
10	Y	0	0	53	5	
11	Y	0	0	18	5	
12	Y	0	0	32	5	
13	Y	0	0	27	5	
14	Y	0	0	26	4	
15	Y	0	1	103	4	
<i>N: 15</i>	<i>Σ Success: 15</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>Σ: 2</i> <i>x: 0.13</i>	<i>x: 46.2</i>	<i>x: 4.33</i>	

#1 - User sees the allergy card collapsed, but doesn't realize he can click on the header to open the card.

Task: 2.1 - Trigger CDS intervention for drug-allergy interaction.

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	69	4	
2	Y	0	0	6	3	
3	Y	0	0	18	5	
4	Y	0	0	5	3	
5	Y	0	0	5	4	
6	N	1	0	---	4	#1
7	Y	0	0	5	2	
8	Y	0	0	5	5	
9	Y	0	0	67	5	
10	Y	0	0	10	5	
11	Y	0	0	10	4	
12	Y	0	0	5	5	
13	Y	0	0	47	5	
14	Y	0	0	5	4	
15	Y	0	0	10	4	
<i>N: 15</i>	<i>Σ Success: 14</i>	<i>Σ: 1</i>	<i>Σ: 0</i>			
		<i>x: 0.07</i>	<i>x: 0</i>	<i>x: 19.07</i>	<i>x: 4.13</i>	

#1 - Participants closed pop-up before reading and processing the it's content, and were unable to describe the content when asked.

Task: 3 - Modify medication allergy

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	25	5	
2	Y	0	0	15	5	
3	Y	0	0	49	5	
4	Y	0	0	15	3	
5	Y	0	0	14	4	
6	Y	0	1	12	4	#1
7	Y	0	0	41	4	
8	Y	0	0	25	5	
9	Y	0	0	59	5	
10	Y	0	0	25	5	
11	Y	0	0	37	5	
12	Y	0	0	44	5	
13	Y	0	0	17	5	
14	Y	0	0	13	5	
15	Y	0	0	75	4	
<i>N: 15</i>	Σ Success: 15	Σ : 0 x: 0	Σ : 1 x: 0.07	x: 31.07	x: 4.6	

#1 - Participant deleted the existing drug allergy, then added a new one rather than modifying the original.

Task: 4 - Review Active / Inactive medication allergies.

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	15	4	
2	Y	0	1	47	2	#1
3	N	1	0	---	3	#2
4	N	1	0	---	2	#2
5	Y	0	1	119	2	
6	Y	0	0	35	3	
7	Y	0	0	9	4	
8	Y	0	0	52	5	
9	Y	0	0	42	5	
10	Y	0	0	74	5	
11	Y	0	1	12	4	
12	N	0	0	---	2	#3
13	Y	0	0	51	5	
14	Y	0	1	64	2	
15	Y	0	0	85	4	
N: 15	Σ Success: 12	Σ : 2 x: 0.13	Σ : 4 x: 0.27	x: 50.42	x: 3.47	

#1 - Participant was confused by the fact that the allergies card shows only the 'Active' allergies by default (i.e. it is pre-filtered) without showing that it is filtered. If the participant wants to show all Allergies he / she must set a filter on the card to 'All'.

#2 - Participant experienced difficulty finding the Allergies card. The card exists in the left column, but the participant is not aware that he can click on the header in order to open it and view the contents.

#3 - Participant was confused by the 'Status' dropdown within the allergy UI. It is meant to be used to set the status on a new or selected allergy. Instead the participant thought it could be used to filter the list of allergies to show only those with the selected status.

Task: 5 - Record medication via CPOE

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	1	112	3	#1
2	Y	0	0	49	3	
3	N	1	0	---	2	#2
4	N	1	0	---	4	#2
5	N	1	0	---	2	#2
6	Y	0	0	67	3	
7	N	0	1	---	4	
8	N	1	0	---	4	#2
9	Y	0	0	101	5	
10	Y	0	0	68	5	
11	N	1	0	---	5	#2
12	N	1	0	---	5	#2
13	Y	0	0	140	3	
14	Y	0	0	44	3	
15	Y	0	0	119	4	
<i>N: 15</i>	<i>Σ Success: 8</i>	<i>Σ: 6</i> <i>x̄: 0.4</i>	<i>Σ: 2</i> <i>x̄: 0.13</i>	<i>x̄: 87.5</i>	<i>x̄: 3.67</i>	

#1 - Participant went first to a note to record the medication.

#2 - Participant failed to mark the 'Record Only' checkbox.

Task: 6 - Modify medication via CPOE

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	126	3	#1
2	Y	0	1	55	3	
3	N	0	0	---	3	#2
4	Y	0	0	222	3	
5	Y	0	0	60	3	
6	Y	0	1	324	2	#1
7	Y	0	0	6	4	
8	Y	0	0	151	4	
9	Y	0	0	41	5	
10	Y	0	0	62	5	
11	Y	0	0	61	5	
12	Y	0	0	104	4	#3
13	Y	0	1	120	5	
14	Y	0	1	34	2	
15	Y	0	0	90	4	
N: 15	Σ Success: 14	Σ : 0 x: 0	Σ : 4 x: 0.27	\bar{x} : 104	\bar{x} : 3.67	

#1 - Participant searched for "ointment". The search is literal and matches exactly, instead of being fuzzy and adaptive. No matches are shown.

#2 - Participant declared she would not do this task in her job and refuses to complete the task.

#3 - Participant noticed that the Medications card content on the cards page doesn't show the updated medication and is confused. "Did the change save or didn't it."

Task: 7 - Record medication via CPOE

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	1	116	4	
2	Y	0	0	32	3	
3	N	1	0	---	2	
4	Y	0	0	122	3	
5	Y	0	0	34	2	
6	Y	0	0	25	3	
7	Y	1	0	67	4	
8	Y	0	0	45	4	
9	Y	0	0	67	5	
10	Y	0	0	64	5	
11	Y	0	0	79	5	
12	Y	0	0	71	5	
13	Y	0	0	5	5	
14	Y	0	0	56	3	
15	Y	0	0	57	4	
<i>N: 15</i>	<i>Σ Success: 14</i>	$\Sigma: 2$ $\bar{x}: 0.13$	$\Sigma: 1$ $\bar{x}: 0.07$	$\bar{x}: 60$	$\bar{x}: 3.8$	

Task: 7.1 - Display drug-drug contraindication intervention(s) based on the patient's medication list prior to completing the order.

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	11	4	
2	Y	0	0	4	5	
3	N	1	0	---	4	
4	Y	0	0	2	4	
5	Y	0	0	5	4	
6	Y	0	0	5	4	
7	Y	0	0	6	4	
8	Y	0	0	5	5	
9	Y	0	0	5	5	
10	Y	0	0	5	4	
11	Y	0	0	3	5	
12	Y	0	0	0	5	
13	Y	0	0	10	5	
14	Y	0	0	5	3	
15	Y	0	0	10	4	
<i>N: 15</i>	<i>Σ Success: 14</i>	<i>Σ: 1</i> <i>x: 0.07</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>x: 5.85</i>	<i>x: 4.33</i>	

Task: 7.2 - Trigger, attend and interpret CDS intervention for meds, and access and share med information with the patient.

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	11	4	
2	Y	0	0	4	5	
3	N	1	0	---	4	
4	Y	0	0	2	4	
5	Y	0	0	5	4	
6	Y	0	0	5	4	
7	Y	0	0	6	4	
8	Y	0	0	5	5	
9	Y	0	0	5	5	
10	Y	0	0	5	4	
11	Y	0	0	3	5	
12	Y	0	0	0	5	
13	Y	0	0	10	5	
14	Y	0	0	5	3	
15	Y	0	0	10	4	
<i>N: 15</i>	<i>Σ Success: 14</i>	<i>Σ: 1</i>	<i>Σ: 0</i>			
		<i>x: 0.07</i>	<i>x: 0</i>	<i>x: 5.85</i>	<i>x: 4.33</i>	

Task: 7.2 - Trigger, attend and interpret CDS intervention for drug-allergy interaction, and access information.

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	11	4	
2	Y	0	0	4	5	
3	N	1	0	---	4	
4	Y	0	0	2	4	
5	Y	0	0	5	4	
6	Y	0	0	5	4	
7	Y	0	0	6	4	
8	Y	0	0	5	5	
9	Y	0	0	5	5	
10	Y	0	0	5	4	
11	Y	0	0	3	5	
12	Y	0	0	0	5	
13	Y	0	0	10	5	
14	Y	0	0	5	3	
15	Y	0	0	10	4	
<i>N: 15</i>	<i>Σ Success: 14</i>	<i>Σ: 1 x̄: 0.07</i>	<i>Σ: 0 x̄: 0</i>	<i>x̄: 5.85</i>	<i>x̄: 4.33</i>	

Task: 9 - Create lab order

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	4	5	
2	Y	0	1	42	4	
3	Y	0	0	66	5	
4	Y	0	1	61	4	
5	Y	0	0	21	4	
6	Y	0	0	16	4	
7	Y	0	0	74	2	
8	Y	0	1	129	4	
9	Y	0	0	59	5	
10	Y	0	0	34	5	
11	Y	0	0	38	5	
12	Y	0	0	40	5	
13	Y	0	1	88	4	
14	Y	0	0	14	3	
15	Y	0	0	60	3	
<i>N: 15</i>	<i>Σ Success: 15</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>Σ: 4</i> <i>x: 0.27</i>	<i>x: 49.73</i>	<i>x: 4.13</i>	

Task: 10 - Modify lab order

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	2	5	
2	Y	0	1	45	4	
3	Y	0	0	2	5	
4	Y	0	0	8	4	
5	Y	0	0	2	4	
6	Y	0	2	279	2	#1
7	Y	0	1	164	4	#1, #2
8	Y	0	0	2	5	
9	Y	0	0	53	5	
10	Y	0	0	20	5	
11	Y	0	1	63	3	#1, #2
12	Y	0	0	41	5	
13	Y	0	0	13	5	
14	Y	0	0	18	4	
15	Y	0	0	88	4	
N: 15	Σ Success: 15	Σ : 0 x: 0	Σ : 5 x: 0.33	x: 53.33	x: 4.27	

#1 - Participant created a new order instead of modifying the original.

#2 - Participant is unable to locate the patient order card because it is now off the bottom of the viewable page and the user must scroll to find it.

Task: 11 - Create imaging order

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	1	112	3	
2	Y	0	0	28	2	
3	N	1	0	---	5	
4	Y	0	3	143	2	#1
5	Y	0	0	20	4	
6	Y	0	1	86	3	#1
7	Y	0	0	14	4	
8	Y	0	0	24	5	
9	Y	0	0	15	5	
10	Y	0	1	91	4	#1, #2
11	Y	0	1	94	3	#1, #2
12	Y	0	0	25	5	
13	Y	0	0	81	4	
14	Y	0	0	31	3	
15	Y	0	1	186	3	#1
N: 15	Σ Success: 14	Σ : 1 x: 0.07	Σ : 8 x: 0.53	x: 67.86	x: 3.67	

#1 - Participant couldn't find the imaging order test panel.

#2 - Participant attempted to search for "Chest XRay" with no result. Searching for "Chest" or "Xray" yielded the result the participant was looking for.

Task: 12 - Modify imaging order

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	1	5	5	#1
2	Y	0	0	30	1	
3	N	1	1	---	5	#2
4	Y	0	0	12	3	
5	Y	0	0	2	4	
6	Y	0	1	52	2	#3
7	Y	0	0	29	4	
8	Y	0	0	21	5	
9	Y	0	0	11	5	
10	Y	0	0	12	5	
11	Y	0	0	14	4	
12	Y	0	0	8	5	
13	Y	0	0	3	4	
14	Y	0	0	10	5	
15	Y	0	0	35	4	
<i>N: 15</i>	<i>Σ Success: 14</i>	<i>Σ: 1 x̄: 0.07</i>	<i>Σ: 3 x̄: 0.2</i>	<i>x̄: 17.43</i>	<i>x̄: 4.07</i>	

#1 - Participant couldn't find the Orders card containing the newly added order that was to be modified.

#2 - Participant located the Orders card in the left panel, but it was closed / collapsed. The participant didn't know to click on the collapsed header to open and view the card contents.

#3 - Participant created a new order instead of modifying the original.

Task: 13 - Record problem

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	89	4	
2	Y	0	1	70	3	
3	N	1	0	---	4	#1
4	Y	0	2	172	3	#1, #2
5	Y	0	0	66	4	
6	Y	0	0	68	3	
7	Y	0	1	118	2	#2
8	Y	0	1	206	4	#2
9	Y	0	1	136	4	#1
10	Y	0	1	73	4	#1
11	Y	0	0	39	5	
12	Y	0	1	92	4	#1
13	Y	0	1	96	3	#2
14	Y	0	1	72	2	#1
15	N	1	1	---	2	#1
<i>N: 15</i>	<i>Σ Success: 13</i>	<i>Σ: 2 x̄: 0.13</i>	<i>Σ: 11 x̄: 0.73</i>	<i>x̄: 99.77</i>	<i>x̄: 3.4</i>	

#1 - Participant attempted to click into the problem field and type to initiate a search. The user must first click on the search icon and then type into a pop-up dialog in order to search.

#2 - Participant experienced difficulty finding the patient Problems card in the left column because it was below the viewable area of the screen.

Task: 13.1 - Trigger, attend and interpret CDS intervention for problem, and access information.

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	133	3	
2	Y	0	0	19	2	
3	Y	0	0	97	4	
4	Y	0	0	104	3	
5	Y	0	0	65	4	
6	Y	0	0	2	3	
7	Y	0	1	33	4	#1
8	Y	0	0	77	3	
9	Y	0	0	22	5	
10	Y	0	1	135	3	#1
11	Y	0	0	10	5	
12	Y	0	0	46	5	
13	Y	0	1	95	1	#1
14	Y	0	0	25	4	
15	Y	0	0	14	4	
<i>N: 15</i>	<i>Σ Success: 15</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>Σ: 3</i> <i>x: 0.2</i>	<i>x: 58.47</i>	<i>x: 3.53</i>	

#1 - Participant experienced difficulty finding patient educational material by clicking on an InfoButton icon.

Task: 14 - Modify problem

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	187	5	
2	Y	0	0	142	4	
3	Y	0	0	5	5	
4	Y	0	0	125	2	
5	Y	0	0	14	5	
6	Y	0	0	30	3	
7	Y	0	0	22	5	
8	Y	0	0	5	5	
9	Y	0	0	12	5	
10	Y	0	0	16	5	
11	Y	0	0	9	5	
12	Y	0	0	35	5	
13	Y	0	0	9	0	
14	Y	0	0	3	4	
15	Y	0	0	10	4	
<i>N: 15</i>	<i>Σ Success: 15</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>x: 41.6</i>	<i>x: 4.43</i>	

Task: 15 - Review Active / Historical problems

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	43	5	
2	Y	0	0	5	4	
3	Y	0	0	2	5	
4	Y	0	0	14	4	
5	Y	0	0	2	5	
6	Y	0	0	20	3	
7	Y	0	0	18	5	
8	Y	0	0	2	5	
9	Y	0	0	15	5	
10	Y	0	0	5	5	
11	Y	0	0	6	5	
12	Y	0	0	2	5	
13	Y	0	0	8	5	
14	Y	0	0	5	4	
15	Y	0	0	10	4	
<i>N: 15</i>	<i>Σ Success: 15</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>x: 10.47</i>	<i>x: 4.6</i>	

Task: 16 - Prescribe medication

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	81	4	
2	Y	0	0	70	4	
3	Y	0	0	92	5	
4	Y	0	0	61	4	
5	Y	0	0	133	err	*
6	Y	0	0	161	err	*
7	Y	0	0	43	4	
8	Y	0	0	84	4	
9	Y	0	0	51	5	
10	Y	0	0	73	5	
11	Y	0	0	65	5	
12	Y	0	0	78	5	
13	Y	0	0	72	5	
14	Y	0	0	49	4	
15	Y	0	0	162	4	
<i>N: 15</i>	<i>Σ Success: 15</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>x: 85</i>	<i>x: 4.46</i>	

* Administrator failed to record user satisfaction rating for task.

Task: 16.1 - Trigger, attend and interpret CDS intervention for drug, then locate suggested therapeutic/diagnostic resources.

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	1	2	4	
2	N	1	1	---	4	#1
3	Y	0	1	29	5	
4	Y	0	1	32	4	
5	Y	0	0	5	err	*
6	Y	0	0	0	err	*
7	Y	0	0	34	4	
8	Y	0	0	71	4	
9	Y	0	0	5	5	
10	Y	0	0	0	5	
11	Y	0	0	3	5	
12	Y	0	0	110	5	
13	Y	0	0	24	5	
14	Y	0	0	8	5	
15	Y	0	0	7	5	
<i>N: 15</i>	<i>Σ Success: 14</i>	<i>Σ: 1</i> <i>x: 0.07</i>	<i>Σ: 4</i> <i>x: 0.27</i>	<i>x: 27.5</i>	<i>x: 4.62</i>	

* Administrator failed to record user satisfaction rating for task.

#1 - Participant failed to see and/or couldn't describe the content of the CDS pop-up.

Task: 17 - Modify prescription

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	25	2	
2	Y	0	0	33	3	
3	Y	0	0	38	3	
4	Y	0	1	141	2	#1
5	Y	0	0	75	4	
6	Y	0	1	209	err	*, #1
7	Y	0	0	15	4	
8	Y	0	0	69	4	
9	Y	0	0	47	5	
10	Y	0	0	45	3	
11	Y	0	0	50	5	
12	Y	0	0	129	3	
13	Y	0	0	70	4	
14	Y	0	0	11	4	
15	Y	0	0	54	4	
<i>N: 15</i>	<i>Σ Success: 15</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>Σ: 2</i> <i>x: 0.13</i>	<i>x: 67.4</i>	<i>x: 3.57</i>	

* Administrator failed to record user satisfaction rating for task.

#1 - Participant deleted the original prescription and created a new one instead of modifying the original prescription.

Task: 18 - Make medication historical

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	1	10	4	#1
2	N	1	2	---	4	#1
3	Y	0	1	322	5	
4	Y	0	1	75	3	#1
5	Y	0	1	5	2	#1
6	N	1	0	---	2	
7	Y	0	0	10	5	
8	Y	0	0	94	4	
9	Y	0	0	13	5	
10	Y	0	0	76	5	
11	Y	0	0	54	5	
12	Y	0	1	147	5	
13	Y	0	0	38	5	
14	N	1	0	---	5	#1
15	Y	0	0	65	4	
<i>N: 15</i>	<i>Σ Success: 12</i>	<i>Σ: 3</i> <i>x: 0.2</i>	<i>Σ: 7</i> <i>x: 0.47</i>	<i>x: 75.75</i>	<i>x: 4.2</i>	N/A

#1 - With a single medication is open (not in the medications tab), the participant did not know to mark the medication as Historic by unchecking the "Current" checkbox.

Task: 19 - Review Current / Historical medications

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	1	25	4	
2	Y	0	0	3	5	
3	N	1	0	---	2	#1, #2
4	N	1	0	---	2	#1, #2
5	N	1	0	---	err	*, #1, #2
6	N	1	1	---	2	#1, #2
7	Y	0	0	5	5	
8	Y	0	0	25	4	
9	Y	0	0	40	5	
10	Y	0	1	103	3	#1
11	Y	0	0	40	5	
12	Y	0	0	5	5	
13	Y	0	0	66	5	
14	Y	0	0	34	4	
15	Y	0	1	94	4	#1
<i>N: 15</i>	<i>Σ Success: 11</i>	$\Sigma: 4$ $\bar{x}: 0.27$	$\Sigma: 4$ $\bar{x}: 0.27$	$\bar{x}: 40$	$\bar{x}: 3.93$	

* Administrator failed to record user satisfaction rating for task.

#1 - The medications card is not directly filterable like some other patient cards. The participants first looked for a filter mechanism on the card but failing to find one there, had to look elsewhere.

#2 - Participant was unable to locate the status filter on the medications tab.

Task: 20 - Search and Select Patient

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	2	5	
2	Y	0	0	4	5	
3	---	0	0	0	---	*
4	Y	0	0	6	4	
5	Y	0	0	3	5	
6	Y	0	0	2	4	
7	Y	0	0	7	4	
8	Y	0	0	5	5	
9	Y	0	0	3	5	
10	Y	0	0	10	5	
11	Y	0	0	7	5	
12	Y	0	0	5	5	
13	Y	0	0	8	5	
14	Y	0	0	10	5	
15	Y	0	0	11	4	
<i>N: 15</i>	<i>Σ Success: 14</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>x: 5.93</i>	<i>x: 4.71</i>	

* Participant ended the test without completing all of the tasks due to time constraints.

Task: 20.1 - Trigger, attend and interpret CDS intervention for Age/Gender

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	2	5	
2	Y	0	0	19	5	
3	---	0	0	0	---	*
4	Y	0	0	5	4	
5	Y	0	0	2	5	
6	Y	0	0	20	4	
7	Y	0	0	8	4	
8	Y	0	0	30	5	
9	Y	0	0	13	5	
10	Y	0	0	6	5	
11	Y	0	0	8	5	
12	Y	0	0	20	5	
13	Y	0	0	15	5	
14	Y	0	0	12	5	
15	Y	0	0	4	5	
<i>N: 15</i>	<i>Σ Success: 14</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>x: 11.71</i>	<i>x: 4.79</i>	

* Participant ended the test without completing all of the tasks due to time constraints.

Task: 20.2 - Trigger, attend and interpret CDS intervention for lab returns

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	2	5	
2	Y	0	0	19	5	
3	---	0	0	0	---	*
4	Y	0	0	5	4	
5	Y	0	0	2	5	
6	Y	0	0	20	4	
7	Y	0	0	8	4	
8	Y	0	0	30	5	
9	Y	0	0	13	5	
10	Y	0	0	6	5	
11	Y	0	0	8	5	
12	Y	0	0	20	5	
13	Y	0	0	15	5	
14	Y	0	0	12	5	
15	Y	0	0	4	5	
<i>N: 15</i>	<i>Σ Success: 14</i>	<i>Σ: 0</i>	<i>Σ: 0</i>			
		<i>x: 0</i>	<i>x: 0</i>	<i>x: 11.71</i>	<i>x: 4.79</i>	

* Participant ended the test without completing all of the tasks due to time constraints.

Task: 21 - Record Vitals

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	18	2	
2	Y	0	0	36	3	
3	---	0	0	0	---	*
4	Y	0	0	36	4	
5	Y	0	0	65	4	
6	Y	0	0	32	3	
7	Y	0	0	72	4	
8	Y	0	0	48	4	
9	Y	0	0	96	5	
10	Y	0	0	60	5	
11	Y	0	0	32	5	
12	Y	0	0	46	5	
13	Y	0	0	19	5	
14	Y	0	0	95	5	
15	Y	0	0	82	4	
<i>N: 15</i>	<i>Σ Success: 14</i>	<i>Σ: 0</i> <i>χ: 0</i>	<i>Σ: 0</i> <i>χ: 0</i>	<i>χ: 52.64</i>	<i>χ: 4.14</i>	

* Participant ended the test without completing all of the tasks due to time constraints.

Task: 21.1 - Trigger, attend and interpret CDS intervention for vitals

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	67	2	
2	Y	0	0	53	3	
3	---	0	0	0	---	*
4	Y	0	0	25	4	
5	Y	0	0	46	4	
6	Y	0	0	63	3	
7	Y	0	0	72	4	
8	Y	0	0	48	4	
9	Y	0	0	96	5	
10	Y	0	0	60	5	
11	Y	0	0	32	5	
12	Y	0	0	46	5	
13	Y	0	0	18	5	
14	Y	0	0	7	5	
15	Y	0	0	22	5	
<i>N: 15</i>	<i>Σ Success: 14</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>x: 46.79</i>	<i>x: 4.21</i>	

* Participant ended the test without completing all of the tasks due to time constraints.

Task: 22 - Receive CCDA (find and open)

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	N	1	1	---	3	#1
2	Y	0	2	160	2	
3	---	0	0	0	---	*
4	Y	0	0	5	3	
5	Y	0	0	10	4	
6	Y	0	0	48	1	
7	Y	0	0	41	2	
8	N	1	0	---	4	#1
9	N	1	3	---	2	#1
10	Y	0	0	77	4	
11	Y	0	0	18	3	
12	Y	0	0	102	4	
13	Y	0	0	51	3	
14	Y	0	0	3	5	
15	Y	0	0	70	3	
<i>N: 15</i>	<i>Σ Success: 11</i>	<i>Σ: 3</i> <i>x̄: 0.2</i>	<i>Σ: 6</i> <i>x̄: 0.4</i>	<i>x̄: 53.18</i>	<i>x̄: 3.07</i>	

* Participant ended the test without completing all of the tasks due to time constraints.

#1 - Participant is unable to locate the invocation menu for In-bound CDAs.

Task: 23 - Import CCDA and reconcile medications, medication allergies, and problems list.

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	142	4	
2	N	1	0	---	1	#1
3	---	0	0	0	---	*
4	Y	0	1	250	2	#2, #4
5	N	1	2	---	3	#1
6	N	1	0	---	1	#1, #2
7	N	1	1	---	4	#1, #2, #3
8	N	1	0	---	3	#1, #4
9	N	1	1	---	2	#2, #4
10	Y	0	1	232	4	#3
11	Y	0	2	348	4	#2, #3
12	N	1	0	---	5	
13	Y	0	0	86	4	
14	Y	0	1	81	4	
15	N	0	0	---	4	#1, #4
<i>N: 15</i>	Σ Success: 6	Σ : 7 \bar{x} : 0.47	Σ : 9 \bar{x} : 0.6	\bar{x} : 189.83	\bar{x} : 3.21	

* Participant ended the test without completing all of the tasks due to time constraints.

#1 - Participant went through the process, clicking 'Next' to proceed through each step, without actually importing any of the patient data into the patient's chart. Participant thought he had completed the task successfully, but did not.

#2 - Participant didn't initially know to click 'next' button to see the sent data, in order to import it.

#3 - Participant found link to PDF summary of importable data on the first page of the wizard and thought he/she had to manually compare and add the data to the patient's chart.

#4 - Participant didn't know to click on each individual sent chart item to select it, in order to import it.

Task: 23.1 - Trigger, attend and interpret CDS intervention for summary of care.

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	16	4	
2	N	1	0	---	---	#1
3	---	0	0	0	---	#1
4	Y	0	0	5	4	
5	N	1	0	---	---	#1
6	N	1	0	---	---	#1
7	N	1	0	---	---	#1
8	N	1	0	---	---	#1
9	N	1		---	---	#1
10	Y	0	0	5	4	
11	Y	0	0	9	4	
12	N	1	0	---	---	#1
13	Y	0	0	7	4	
14	Y	1	0	13	4	
15	N	1	0	---	---	#1
<i>N: 15</i>	Σ Success: 6	Σ : 9	Σ : 0			
		\bar{x} : 0.6	\bar{x} : 0	\bar{x} : 9.17	\bar{x} : 4	

#1 - Participants didn't see the CDS if they did not successfully import the summary of care. However, those who did trigger the alert easily found it and understood it.

Task: 24 - Generate and send CCDA with medications, medication allergies, and problems list.

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	173	4	#1
2	Y	0	0	112	1	
3	---	0	0	0	---	*
4	Y	0	0	148	2	#1
5	Y	0	0	125	3	
6	N	1	0	---	1	#1
7	Y	0	0	163	4	
8	Y	0	0	98	3	
9	Y	0	0	300	2	#1
10	Y	0	0	120	4	
11	Y	0	0	114	4	
12	Y	0	0	146	5	
13	Y	0	0	207	4	#1
14	Y	0	0	124	4	
15	Y	0	0	105	3	
N: 15	Σ Success: 13	Σ : 1 \bar{x} : 0.07	Σ : 0 \bar{x} : 0	\bar{x} : 148.85	\bar{x} : 3.14	

* Participant ended the test without completing all of the tasks due to time constraints.

#1 - Participant had difficulty or was unable to find the Outbound CDA menu item.

Task: 25 - Record implanted device

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	1	330	3	#1
2	Y	0	0	101	2	
3	---	0	0	0	---	*, #1
4	Y	0	0	318	4	
5	Y	0	1	145	4	#1
6	Y	0	0	324	3	
7	Y	0	0	141	4	
8	Y	0	1	115	4	#2
9	Y	0	0	25	5	
10	Y	0	1	151	5	#1, #3
11	N	1	0	---	5	#4
12	Y	0	0	67	4	
13	Y	0	0	170	4	
14	err	0	0	0	err	**
15	err	0	0	0	err	**
<i>N: 15</i>	<i>Σ Success: 11</i>	<i>Σ: 1</i> <i>x: 0.07</i>	<i>Σ: 4</i> <i>x: 0.27</i>	<i>x: 171.55</i>	<i>x: 3.92</i>	

* Participant ended the test without completing all of the tasks due to time constraints.

** System Error: System administrator accidentally disabled this functionality for the final two participants.

#1 - Participant had difficulty finding the implantable device card.

#2 - System Error: Required field indicators do not respond (turn off) to show that the field has been filled, therefore the participant was unable to determine which fields he / she had not filled that were required to be filled.

#3 - Participant thought he / she had saved the device to the list, but had not.

#4 - Participant accidentally clicked on and edited a different implantable device, and saved it thinking he / she was saving the original device.

Task: 26 - Modify implanted device

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	3	3	
2	Y	0	0	25	4	
3	---	0	0	0	---	*
4	Y	0	0	2	4	
5	Y	0	0	5	4	
6	Y	0	0	33	3	
7	Y	0	0	16	5	
8	Y	0	0	30	4	
9	Y	0	1	53	5	#1
10	Y	0	0	10	5	
11	Y	0	0	31	4	
12	Y	0	0	5	5	
13	Y	0	0	20	5	
14	err	0	0	0	err	**
15	err	0	0	0	err	**
N: 15	Σ Success: 12	Σ : 0 x: 0	Σ : 1 x: 0.07	x: 19.42	x: 4.25	

* Participant ended the test without completing all of the tasks due to time constraints.

** System Error: System administrator accidentally disabled this functionality for the final two participants.

#1 - System Error: Required field indicators do not respond (turn off) to show that the field has been filled, therefore the participant was unable to determine which fields he / she had not filled that were required to be filled.

Task: 27 - Review implanted devices

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	3	4	
2	Y	0	0	2	5	
3	---	0	0	0	---	*
4	Y	0	0	5	4	
5	Y	0	0	3	4	
6	Y	0	0	10	4	
7	Y	0	0	33	4	
8	Y	0	0	14	5	
9	Y	0	0	12	5	
10	Y	0	0	10	5	
11	Y	0	0	17	5	
12	Y	0	0	10	5	
13	Y	0	0	5	5	
14	err	0	0	0	err	**
15	err	0	0	0	err	**
<i>N: 15</i>	<i>Σ Success: 12</i>	<i>Σ: 0</i> <i>χ: 0</i>	<i>Σ: 0</i> <i>χ: 0</i>	<i>χ: 10.33</i>	<i>χ: 4.58</i>	

* Participant ended the test without completing all of the tasks due to time constraints.

** System Error: System administrator accidentally disabled this functionality for the final two participants.

Task: 28 - Change active implanted device to inactive

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	9	5	
2	Y	0	0	14	5	
3	---	0	0	0	---	*
4	Y	0	0	5	4	
5	Y	0	0	5	4	
6	N	1	0	---	2	#1
7	Y	0	0	27	4	
8	Y	0	0	10	5	
9	Y	0	0	15	3	
10	Y	0	0	9	5	
11	Y	0	0	21	4	
12	Y	0	1	10	5	
13	Y	0	0	17	5	
14	err	0	0	0	err	**
15	err	0	0	0	err	**
<i>N: 15</i>	<i>Σ Success: 11</i>	<i>Σ: 1</i> <i>x̄: 0.07</i>	<i>Σ: 1</i> <i>x̄: 0.07</i>	<i>x̄: 12.91</i>	<i>x̄: 4.25</i>	

* Participant ended the test without completing all of the tasks due to time constraints.

** System Error: System administrator accidentally disabled this functionality for the final two participants.

#1 - Participant was unable to locate active / inactive switch on the implantable device record.

Task: 29 - Review (filter) active/inactive implanted devices

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	5	4	
2	Y	0	1	63	2	#1
3	---	0	0	0	---	*
4	Y	0	0	4	4	
5	Y	0	0	7	4	
6	Y	0	0	10	4	
7	Y	0	0	71	5	
8	Y	0	0	19	4	
9	Y	0	1	8	4	#1
10	Y	0	0	8	5	
11	N	1	0	---	2	#1
12	Y	0	0	4	5	
13	Y	0	0	14	5	
14	err	0	0	0	err	**
15	err	0	0	0	err	**
<i>N: 15</i>	<i>Σ Success: 11</i>	<i>Σ: 1</i> <i>x̄: 0.07</i>	<i>Σ: 2</i> <i>x̄: 0.13</i>	<i>x̄: 19.36</i>	<i>x̄: 4</i>	

* Participant ended the test without completing all of the tasks due to time constraints.

** System Error: System administrator accidentally disabled this functionality for the final two participants.

#1 - Participant expects to find a filter mechanism within the main view of the implantable device, but there is none.

Task: 30 - Record patient demographics

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	103	5	
2	Y	0	0	97	4	
3	Y	0	0	0	---	*
4	Y	0	0	167	3	
5	Y	0	0	132	4	
6	Y	0	0	278	4	
7	Y	0	0	149	4	
8	Y	0	0	285	3	
9	Y	0	0	231	4	
10	Y	0	0	210	5	
11	Y	0	0	245	4	
12	Y	0	0	112	5	
13	Y	0	0	70	5	
14	Y	0	0	131	3	
15	Y	0	0	310	3	
<i>N: 15</i>	<i>Σ Success: 15</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>x: 180</i>	<i>x: 4</i>	

* Participant ended the test without completing all of the tasks due to time constraints.

Task: 31 - Modify patient demographics

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
1	Y	0	0	10	5	
2	Y	0	0	19	5	
3	Y	0	0	0	---	*
4	Y	0	0	5	4	
5	Y	0	0	23	4	
6	Y	0	0	20	4	
7	Y	0	0	15	5	
8	Y	0	0	45	4	
9	Y	0	0	54	5	
10	Y	0	0	10	5	
11	Y	0	0	70	4	
12	Y	0	0	25	5	
13	Y	0	0	24	5	
14	Y	0	0	44	3	
15	Y	0	0	35	4	
<i>N: 15</i>	<i>Σ Success: 15</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>x: 28.5</i>	<i>x: 4.43</i>	

* Participant ended the test without completing all of the tasks due to time constraints.

Task: 32 - Create new ePrescribed liquid medication (metric only)

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
16	Y	0	0	120	5	
17	Y	0	1	137	5	
18	Y	0	0	104	4	
19	N	1	0	---	err	
20	N	1	0	---	err	
21	Y	0	0	120	5	
22	Y	0	1	137	3	
23	Y	0	0	104	3	
24	N	1	0	---	5	
25	N	1	0	---	5	
<i>N: 10</i>	Σ Success: 6	Σ : 4 \bar{x} : 0.4	Σ : 2 \bar{x} : 0.2	\bar{x} : 120.33	\bar{x} : 4.38	

Task: 33 - Cancel ePrescribed medication and view cancellation response

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
16	N	0	0	---	err	
17	Y	0	1	65	3	
18	Y	0	1	109	1	
19	N	1	0	---	err	
20	N	1	0	---	err	
21	N	0	0	---	3	
22	Y	0	1	65	1	
23	Y	0	1	109	err	
24	N	1	0	---	err	
25	N	1	0	---	err	
<i>N: 10</i>	<i>Σ Success: 4</i>	<i>Σ: 4</i> <i>x: 0.4</i>	<i>Σ: 4</i> <i>x: 0.4</i>	<i>x: 87</i>	<i>x: 2</i>	

Task: 34 - Review and approve eRefill medication request, deny refill renewal, approve and allow refills.

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
16	Y	0	1	49	5	
17	Y	0	0	56	5	
18	Y	0	1	63	5	
19	Y	0	0	84	5	
20	Y	0	1	33	5	
21	Y	0	1	49	5	
22	Y	0	0	56	5	
23	Y	0	1	63	5	
24	Y	0	0	84	5	
25	Y	0	1	33	4	
<i>N: 10</i>	<i>Σ Success: 10</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>Σ: 6</i> <i>x: 0.6</i>	<i>x: 57</i>	<i>x: 4.9</i>	

Task: 35 - Review and respond to pharmacy change request: Approve/Deny a Therapeutic Change

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
16	Y	0	0	33	3	
17	Y	0	0	28	5	
18	Y	0	0	35	5	
19	Y	0	0	26	5	
20	Y	0	0	23	5	
21	Y	0	0	33	err	
22	Y	0	0	28	5	
23	Y	0	0	35	1	
24	Y	0	0	26	4	
25	Y	0	0	23	5	
<i>N: 10</i>	<i>Σ Success: 10</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>x: 29</i>	<i>x: 4.22</i>	

Task: 36 - Review and respond to pharmacy change request: Approve/Deny a Generic Change

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
16	Y	0	0	74	5	
17	Y	0	0	30	5	
18	Y	0	0	24	5	
19	Y	0	0	10	5	
20	Y	0	0	57	5	
21	Y	0	0	74	1	
22	Y	0	0	---	---	
23	Y	0	0	24	5	
24	Y	0	0	10	5	
25	Y	0	0	57	5	
<i>N: 10</i>	<i>Σ Success: 10</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>x: 40</i>	<i>x: 4.56</i>	

Task: 37 - Review and respond to pharmacy change request: Approve/Deny Prior Authorization.

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
16	Y	0	0	121	4	
17	Y	0	0	27	5	
18	Y	0	0	22	5	
19	Y	0	0	7	5	
20	Y	0	0	20	5	
21	Y	0	0	121	2	
22	Y	0	0	27	4	
23	Y	0	0	22	5	
24	Y	0	0	7	5	
25	Y	0	0	20	5	
<i>N: 10</i>	<i>Σ Success: 10</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>Σ: 0</i> <i>x: 0</i>	<i>x: 39.4</i>	<i>x: 4.5</i>	

Task: 38 - Receive fill status notification

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
26	Y	0	0	69	4	
27	Y	0	0	42	4	
28	Y	0	0	39	5	
29	Y	0	0	60	2	
30	N	1	1	---	2	
31	Y	0	0	177	1	
32	N	1	1	---	4	
33	Y	0	0	131	3	
34	Y	0	0	173	2	
35	N	1	1	---	2	
<i>N: 10</i>	<i>Σ Success: 7</i>	<i>Σ: 3</i>	<i>Σ: 3</i>			
		<i>x̄: 0.3</i>	<i>x̄: 0.3</i>	<i>x̄: 98.71</i>	<i>x̄: 2.9</i>	

In other to locate the fill status notification, the user must know to look in the Prescription history located under and “action” menu. This path is difficult to locate the first time one does the task.

Task: 39 - Request and receive medication history information

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
26	Y	0	2	106	2	
27	Y	0	3	114	4	
28	Y	0	3	7	5	
29	Y	0	0	49	4	
30	N	1	2	---	3	
31	Y	0	0	131	4	
32	Y	0	1	113	3	
33	Y	0	2	155	1	
34	N	1	2	---	3	
35	N	1	2	---	2	
<i>N: 10</i>	<i>Σ Success: 7</i>	<i>Σ: 3</i>	<i>Σ: 17</i>			
		<i>x̄: 0.3</i>	<i>x̄: 1.7</i>	<i>x̄: 96.43</i>	<i>x̄: 3.1</i>	

The user must locate a text link that is embedded in other textual information about the patient. The link / button doesn't stand out against this background information.

Task: 40 - Adjust the severity level of CDS interventions for drug-drug interaction checks

ID	Effectiveness		Efficiency		Satisfaction	Notes
	Task Success	Errors #	Path Deviations #	Task Time (Seconds)	Task Ratings (5-Very Easy)	
26	Y	0	2	107	2	
27	Y	0	0	62	3	
28	Y	0	0	4	5	
29	Y	0	0	65	4	
30	Y	0	0	81	2	
31	Y	0	0	113	4	
32	Y	0	1	57	1	
33	N	1	1	---	4	
34	Y	0	0	36	4	
35	Y	0	0	87	4	
<i>N: 10</i>	<i>Σ Success: 9</i>	<i>Σ: 1</i>	<i>Σ: 4</i>			
		<i>x̄: 0.1</i>	<i>x̄: 0.4</i>	<i>x̄: 68</i>	<i>x̄: 3.3</i>	

This is a set-up task typically done by an administrator. The location of the function is not on “the beaten path” of the user’s typical workflow.

4.2 DISCUSSION OF FINDINGS

4.2.1 EFFECTIVENESS

The EHRUT tested well overall, with 36 of the 49 tasks having a 90% or greater success rate (39 of 49 above 80%), success being defined as task completion with no critical errors. Additionally in nearly all cases, participants were performing the tasks for the first time with no prior task specific training (training prior to the test was limited to a 3 minutes demonstration of a new UI concept called 'Patient Cards' and its use in navigating the patient chart).

Although the EHRUT tested well overall, there were areas and specific tasks which tested poorly. These include Task 5 (Record Medications via CPOE), Task 19 (Review Current / Historical medications) and Task 23 (Import CCDA and reconcile medications, medication allergies, and problem lists.) The root cause of the poor performance became clear during testing in each of these cases, and will be addressed in the normal development process of AdvancedMD.

4.2.2 EFFICIENCY

Tasks success decreased significantly when the definition of success was constrained to accomplishing the task within a prespecified target time. Only 11 of the 49 tasks had a 90% or better average rate of 'Success within target time' (24 of 49 tasks above 80%, 31 of 44 above 70%). This may be partly attributable to the fact that in almost all cases the tasks were being performed for the first time and without prior tasks based training, and participants required time to orient themselves to the new UI. It is to be assumed that the time required for the average user to complete each task will decrease significantly and precipitously with repeated daily usage (further study may be need to confirm this assumption), or with task specific training.

Target task times were determined based on optimal task times (See Section 3.9 USABILITY METRICS). 'Optimal task time' is operationally defined as the expected average time required for a practiced expert to accomplish the task, which is a measure of the efficiency of the system over time. So the lower the optimal task time, or the more efficient the system is in the long run, the lower is the target time and the lower is the chance that the new user will achieve that time on their first attempt at the task.

Participant deviations from the ideal path also had an effect on task completion times. Tasks with a higher number of recorded path deviations were less likely to be completed within target times. Most path deviations were of a minor nature, short deviations due to poor user interface design or implementation issues, which the participant quickly recovered from. Other deviations were more costly in terms of time, and more frustrating to the participants. Both minor and major path deviations were recorded and have been reported above for each task. Their causes and solutions will not be considered briefly below (see MAJOR FINDINGS and AREAS FOR IMPROVEMENT), but will be considered more fully in the normal processes of AdvancedMD's software development.

4.3.3 SATISFACTION

On average, participants rated the tasks as “Easy” (4.01 on a 5 points scale). Participants rated 42 of the 49 tasks at 3.5 or above on an Ease of Use scale (4 = easy, 3 = neither easy nor difficult), with 31 of the 44 tasks rated at 4 or higher.

Tasks with the lowest scores on the Ease of Use scale were those with correspondingly low success rates and high error and deviation rates. This is likely due to underlying and recurring usability problems within the tasks paths. Satisfaction, and measures of effectiveness and efficiency, will increase as these problems are resolved.

The results from the System Usability Scale (SUS) scored the subjective satisfaction for all tasks as 75.1.

4.3.4 RISK EVALUATION

An average of the success rates for tasks within Task Risk Categories shows that tasks across all risk levels had close to a 90% chance of success on the first attempt. A mean Ease of Use ratings close to 4 in each category shows that participant satisfaction was high for the most critical tasks, as well as for less critical tasks (High Risk 4.14, Medium Risk 3.93, Low risk 3.85).

The number and severity of critical errors and minor path deviations varied widely between tasks, but averaged out across the tasks within each Task Risk Category, so that mean errors and deviations were near 0 in each category.

Tasks with the lowest subjective satisfaction rates were in the Low risk category.

Table: Results by Task Risk Category.

Task Risk	Success (%)		Errors Mean	Deviations Mean	Task Rating Mean	Tasks
	Total	Within Target				
High	90	72	0.05	0.17	4.14	1, 1.1, 2, 2.1, 5, 7, 7.1, 7.2, 8, 13, 13.1, 16, 16.1, 20.1, 20.2, 21.1, 32, 33, 34, 35, 36, 37
Medium	86	61	0.08	0.27	3.93	3, 6, 9, 11, 12, 14, 17, 23, 23.1, 25
Low	89	75	0.11	0.24	3.85	4, 10, 15, 18, 19, 22, 24, 26, 27, 28, 29, 30, 31, 38, 39, 40

4.3.5 MAJOR FINDINGS

- Navigation using Patient Cards was problematic, especially when the cards were collapsed in a column on the left, showing only the top of each card. Participants did not at first realize the the cards were collapsed and could therefore be uncollapsed (open) to view details and access functionality within each card. Also, when one or more of the cards was open on the left, other cards were pushed further down to make room for the open card, meaning that some cards were no longer within the viewable area of the left column without scrolling. Some participants seemed not to realize that they could scroll to see the other cards.
- Inconsistencies in the placement and function of icons and buttons caused confusion. In some cases Patient Cards contain a filter icon for filtering the card contents, in other cases they do not. In some cases the expanded views of the card contents on the right contain a filter mechanism, and in some cases they don't. When they do, in some cases the filtering mechanism is on the top right as an icon, and in some cases it is on the top left as a drop down menu.
- Outdated components and inconsistent user interactions were another source of confusion and error. For example, search boxes that failed to return results when more than one word was typed, or failed to search the content flexibly (words in different orders, words with intervening content). Another example is a search box that can't be directly selected, which requires the user to click a related icon/button, which then reveals a pop-up menu for completing the search.
- The task which presented the participants with the most difficulty was Task 23 - Import CCDA and reconcile medications, medication allergies, and problems list. This was considered a tasks in the Low/Medium Risk category due to the fact that there are other means of obtaining and or verify the information. Also, if the task fails it will shortly be obvious as the user sees the expected information did not show up in the patient's chart. A combination of small usability issues, including hidden functionality and a lack of prompts and appropriate feedback were the main causes, and should be easy to resolve.
- Another task with a relatively high failure rate and the lowest satisfaction rate was Task 33 - Canceling an eSent prescription with the pharmacy. This is a new function to all test participants and while they were unable to send the cancelation, those who failed to complete the task were able to discontinue the medication in the patient chart. Users were confused about how to review the specific cancelation notification.
- The calculation of prescriptions for dosage, instructions, length of prescription etc. limitations in the application (as participants attempted to enter the medication) had a definite and obvious negative impact on task time. Multiple participants were unable to save the medication form until correcting dosage calculation and commented on how difficult this is to complete without calculation help.
- The number of refills input was mislabeled "dispense" rather than "refill" and multiple participants said they did not have confidence the field would accomplish what they wanted and that the word dispense has other implications in their minds.

- Data entry specialists and clinical support staff moved more easily through the tasks than physicians; both the support staff participants and physicians commented that the task of charting completing pharmacy communication is normally done by clinical support staff.
- Users did not recognize that the “Directions” field is a calculated suggestion; though multiple doctors typed in the field first, and then entered data in the calculation fields and expected those fields to update according to the note they previously wrote.
- Users adding patients are confused by having to expand the ellipses to fill out both race, and ethnicity.
- The Acronyms GI and SO (Gender Identity, Sexual Orientation) are not commonly recognized though all users ultimately discovered them.
- Users cannot easily identify whether they have saved a patient form as no indication is given that it was or was not saved.

4.3.6 AREAS FOR IMPROVEMENT

- Redesign left column navigation so that all navigation options are immediately available “above the fold” i.e. without the need to scroll.
- Make placement of important functional invocation points consistent across all pages e.g. filter, save, delete, etc.
- Improve system feedback for system status, e.g. saved / not saved.
- Improve support for dosage calculation and do not require an order of data entry to use dosage calculation support
- Enhance searches to handle data return on “like data” for misspelling and add filters to allow users to limit results to common delivery methods

APPENDICES

APPENDIX 1: Sample Recruiting Screener

Hello, my name is ___. AdvancedMD is seeking doctors and clinicians who are users of AdvancedMD EHR. This study will assist us in designing and developing a solution that meets your needs. Your experiences in using this particular design will greatly help our designers and developers. The testing of our design will take place in your office using remote meeting technology, requiring only your time, thoughts, and suggestions. We expect the session to last approximately 60 minutes. Does this sound like something that interests you?

Participants were limited to clinicians, however no constraints were placed on the age, gender, or software experience of the users being recruited. Demographic information was collected during testing session.

APPENDIX 2: Informed Consent / Release Form

The usability testing process can be stressful and frustrating for the participant (you). For this reason, before we begin, I want to inform you that you are free and entitled to end the test at any time, for any reason, with or without explaining why. Ending this test is in no way a reflection on you, and will have no impact on your relationship with AdvancedMD.

Do you understand that your participation is completely optional, and you can stop at any time, and do you now agree to participate in this usability study?

APPENDIX 3: Background and Demographics questionnaire

AdvancedMD Pre-Study Questionnaire

Age

- 10 - 19
- 20 - 29
- 30 - 39
- 40 - 49
- 50 - 59
- 60 - 69
- 70 - 79
- 80 - 89
- 89 - 90

Gender

- Female
- Male
- Prefer not to say
- Other: _____

Level of Education

- No high school degree
- High school graduate, diploma or the equivalent (for example: GED)
- Some college credit, no degree
- Trade / Technical / Vocational training
- Associate degree
- Bachelor's degree
- Master's degree
- Doctorate degree (e.g. MD, DNP, DMD, PhD)

Years of Professional Experience

Your answer _____

Years of Experience Using AdvancedMD

Your answer _____

Years of Experience Using Other EHRs

Your answer _____

Years of Computer Experience

Your answer _____

What is your role title?

Your answer _____

How would you categorize your Role?

- Provider
- Biller
- Billing Service Manager
- Office Manager
- Clinical Staff
- Office Staff
- Other: _____

APPENDIX 4: Test Instructions

Read each task out loud as you come to it. When you believe you have completed the task, say "Finished".

Complete each task as quickly as you can, then rate the level of difficulty. Please hold your comments and questions regarding the User Interface until after all of the tasks are complete.

If the tasks are unclear, please ask for clarification. Because of the nature of this study, the moderator will not be able to answer questions about the user interface or how you should complete the tasks.

APPENDIX 5: Test Questions / Tasks

- 1 Select patient Maxine Waters. Add BP - 150 / 100, and ICD for Hypertension "i10" and save ICD to Problem List.
- 1.1 Describe what was communicated in the alert.
- 2 Add Amoxicillin to the patient's allergies.
- 3 Change 'Amoxicillin' to 'Penicillins'.
- 4 Display the active Medication Allergies, then display the inactive/historic Medication Allergies.
- 5 Maxine reports that she is currently taking Neomycin - Add Neomycin 500mg to her list of medications.
- 6 Maxine specifies it is ointment she is using – the Neomycin ointment.
- 7 Maxine reports that she is also taking Cefuroxime Axetil – Add Cefuroxime Axetil to her list of medications 250 mg tab.
- 7.1 Describe what was communicated in the alert, and how difficult or easy was it to find and share patient education as suggested.
- 7.2
- 8 Maxine reports that she is also taking Coumadin – Add Coumadin 7.5 oral tablet.

- 9 Add an Order for Cholesterol LDL, then display order in Patient Order card.
- 10 Change the Order to Cholesterol HDL, then confirm the Order is displayed.
- 11 Add an Order for Chest X Ray.
- 12 Change the Order to Chest X Ray 4 views, then display order in Patient Order card.
- 13 Add Asthma to the patient's Problem List (use SNOMED code: 195949008).
- 13.1 Describe what was communicated in the alert, and display patient education to review with Karen.
- 14 Change the problem Bronchitis from Active to Historic.
- 15 Review and confirm that Bronchitis is now listed as 'Historic' in the problem list.
- 16 Prescribe Albuterol 4mg oral tablet.
- 16.1 Describe what was communicated in the alert. Review clinical research on Albuterol. Share patient education for Albuterol with patient.
- 17 Change Albuterol 4mg oral tablet to Albuterol Sulfate 2.5 mg/3 mL.
- 18 Change Ibuprofen to Historical.
- 19 Display the 'historic' medication list, then display the 'Current' medication list.
- 20 Select Patient Joseph Senior.
- 20.1 Describe what was communicated in the alert.
- 20.2
- 21 Using default Patient Note (CDA TOC), enter Vitals – Ht: 74 and Wt: 280 lbs and calculate BMI.
- 21.1 Describe what was communicated in the alert.
- 22 Dr. Anderson from the hospital has sent Isabella Jones' clinical summary for review.
- 23 Retrieve the CDA for Isabella Jones and review the Meds, Allergies and Problems. Add all new Meds, Allergies, Problems and then “Confirm changes to Patient chart”.
- 23.1 Describe what was communicated in the alert.
- 24 Create a CDA / Clinical Summary to send to Dr. Mickey Anderson. Validate new added information is present on CDA.
- 25 Isabella has an implantable device. Add the device to Isabella's chart (moderator will give you the device number).
- 26 Change the implant site of the device.
- 27 Review Isabella's list of implantable devices.
- 28 Select a device (Orthopedic Bone Screw) and change it to 'Inactive'.

- 29 Display only inactive devices.
- 30 Add patient: Jan Brown, PREFERRED LANGUAGE: english, DOB: 12/1/2006, SEX: Female, RACE: White, ETHNICITY: Not hispanic / Latino , SEXUAL ORIENTATION: Straight , GENDER IDENTITY: Female
- 31 Change Jan Browns PREFERRED LANGUAGE to Spanish and her ETHNICITY to Hispanic / Latino.
- 32 Write a new prescription for Sonia Barker 5 mL (milliliters) oral liquid ferrous sulfate once per day for 3 months.
- 33 For patient Ci Li, there is a prescription for Ibuprofen, that has already been eSent. Cancel the prescription with the pharmacy because it causes him stomach pain, then verify the pharmacy confirmed the cancellation.
- 34 Find the refill request for patient Ci Li, approve her refill for transderm-PROC, and allow two refills. Find the refill request for patient Cy Li for transderm-PROC and deny it because the refill is being requested too soon.
- 35 Find the pharmacy therapeutic change request for Felicia Flounder's Lisinopril and verbally describe to me what it appears the pharmacy is requesting. Approve the request. Find the pharmacy therapeutic change request for Felicia Flounder's Lisinopril and deny the request and indicate the patient should contact the provider.
- 36 Find the pharmacy request for generic on Felicia Flounder's Lisinopril and approve the request. Find the pharmacy request for generic on Felicia Flounder's Lisinopril and deny the request because the substitution is not appropriate for the patient.
- 37 Find and approve the prior authorization request for Debra Tucker's Levalbuterol, using authorization number 123. Find and deny the prior authorization request for Debra Tucker's Levalbuterol.
- 38 Check for a fill status on the drug levalbuterol HCl for "PATIENT, TESTx"
- 39 Request the medication history information for patient "Whiteside, Kara".
- 40 Adjust the severity level of CDS interventions for drug-drug interaction checks to Medium.

APPENDIX 6: System Usability Scale (SUS) questions

Strongly disagree 1 – 5 Strongly agree

- 1) I think that I would like to use this system frequently
- 2) I found the system unnecessarily complex
- 3) I thought the system was easy to use

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