

CREDIBLE

EHR Usability Test Report of Credible Behavioral Health Software (Version 11)

Report based on NISTIR 7742 Common Industry Format for Usability Test Reports

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Executive Summary

On December 11th to December 13th, 2017, The Usability People, LLC conducted a summative usability test of Credible Behavioral Health Software. The test was conducted in the Fairfax, VA office of The Usability People over remote tele-conferencing sessions using *Go to Meeting*. The purpose was to test and validate the usability of the current user interface and provide evidence of usability of Credible Behavioral Health Software as the EHR Under Test (EHRUT). Ten (10) healthcare providers matching the target demographic criteria participated in the usability test using the EHRUT in simulated, but representative tasks.

The study focused on measuring the effectiveness of, efficiency of, and satisfaction (ISO 9241-11) with Credible among a sample of participants representing potential users of the system. Performance data was collected on twenty-nine (29) tasks typically conducted on an EHR. Tasks created were based upon the criteria specified within the test procedure structure for evaluating conformance of Electronic Health Record (EHR) technology to the certification criteria defined in certification criteria identified in 45 CFR Part 170 Subpart C of the Health Information Technology: 2015 Edition Health Information Technology (Health IT) Certification Criteria.

Results of the study indicated that the Credible Behavioral Health Software system was quite satisfactory with regards to effectiveness and efficiency and that the participants were very satisfied with the system.

Introduction

The Electronic Health Record System Under Test (EHRUT) tested for this study, Credible Behavioral Health Software (V11), was specifically designed to present medical information to behavioral healthcare providers on desktop computers in standard ambulatory healthcare settings. This study tested and validated the usability of the Credible Behavioral Health Software user interface and provides evidence of the usability of Credible Behavioral Health Software with representative exercises and in realistic user conditions. To this end, measures of effectiveness and efficiency, such as time on task, number of errors made, and completion rates were captured during usability testing. Satisfaction was assessed and user comments collected using two industry-standard questionnaires: The System Usability Scale (SUS) and the Computer System Usability Questionnaire (CSUQ).

Method

Participants

Ten (10) individuals (7 women and 3 men) participated in the EHRUT(s) using Credible Behavioral Health Software. Participants were physicians, nurses, medical assistants, and/or other healthcare/Health IT practitioners. The recruiting process for participants first identified known Credible users of various geographic areas and demographics, targeting a cross-section of the population based on diversification of job role and length of experience with Credible Behavioral Health Software. Those who responded to the invitation to take part in the study were directed to an online questionnaire that served as the participant screener. (The screening questionnaire is provided as Appendix A.) Participants meeting the criteria for participation in the study were contacted and scheduled via email, or telephone and confirmed for their testing session.

Participants in the usability test of Credible Behavioral Health Software had a variety of healthcare backgrounds and demographic characteristics.

Table 1 presents participant characteristics, including demographics, professional experience, computing experience, and previous EHR experience. Participant characteristics reflect the audience of current and future users and meet the criteria designated in the 2015 Edition Certification Companion Guide for Safety-enhanced design - 45 CFR 170.315(g)(3). None of the participants were from the vendor organization (Credible Behavioral Health) that produced and supplied the evaluated system nor did any participant have any direct connection to the testing organization (*The Usability People, LLC*). All participants were compensated for their time.

Table 1. Participant Characteristics

Part ID	Gender	Age	Education	Role/Title	Professional Experience (Years)	Computer Experience (Years)	Experience with Credible (Years)	Assistive Tech Needs
P01	Female	50 to 59	Associate degree	ADON	14	20	3	None
P02	Female	40 to 49	Associate degree	IT Analyst	9	25	0.5	None
P03	Female	50 to 59	Associate degree	Day Support Program Manager	16	20	0.5	None
P04	Female	60 to 69	Doctorate degree (e.g., MD, DNP, DMD, PhD)	Psychiatrist	26	30	6	None
P05	Female	30 to 39	Bachelor's degree	CHR Analyst and Support Specialist	10	15	1	None
P06	Female	40 to 49	Bachelor's degree	Director of Developmental Services	23	25	9	None
P07	Male	40 to 49	Master's degree	APRN	18	25	6	None
P08	Male	30 to 39	Bachelor's degree	Case Management Program Assistant	0	20	4.5	None
P09	Male	30 to 39	Some college credit, no degree	IT Analyst	10	20	6	None
P10	Female	40 to 49	Trade technical vocational training	Support Services Coordinator	6	20	6.5	None

Summary of Participant Characteristics:

Participants had experience with the occupation and expertise that aligns with the capability under testing. The cohort of users who are selected as participants was varied with the product and its intended users and was not limited to clinicians. The demographic characteristics of the test participant characteristics reflected the audience of current and future users.

Gender

Male	3
Female	7

Age Range

20 to 29	0
30 to 39	3
40 to 49	4
50 to 59	2
60 to 69	1
70 to 79	0

Education

Some college credit, no degree	1
Trade technical vocational training	1
Associate degree	3
Bachelor's degree	3
Master's degree	1
Doctorate Degree	1

Years of Experience with Credible

None	0
Up to 3 years	3
3 to 5 years	2
5 to 10 years	5
More than 10 years	0

Study Design

The overall objective of this usability test was to uncover areas where the Credible Behavioral Health Software system performed well – that is, effectively, efficiently, and with satisfaction – and areas where the system failed to serve the clinical documentation and workflow needs of users. Data from this test may be used as a baseline for future tests of updated versions of Credible and/or for comparing Credible Behavioral Health Software with other EHRs presenting the same tasks. In short, this testing serves as both a means to record or benchmark current usability and to identify areas where improvements must be made.

Participants had a range of experience with EHRs in general, but most had at least some experience with the Credible system. Participants completed the Credible Behavioral Health Software usability during individual 60-90-minute *Go to Meeting* sessions. During the test, each participant interacted with various components of the Credible Behavioral Health Software system. Each participant was provided with the same instructions.

Credible Behavioral Health Software was evaluated for effectiveness, efficiency and satisfaction as defined by the following measures collected and analyzed for each participant:

- Number of tasks successfully completed without assistance
- Time to complete the tasks
- Number and description of errors
- Path deviations
- Participant's verbalizations (comments)
- Participant's satisfaction ratings of the system

Tasks

A total of twenty-nine (29) tasks were constructed by The Usability People, LLC. (in close collaboration with Credible staff) to be realistic and representative of the activities a user might engage in while using Credible in actual medical settings. The twenty-nine (29) tasks were created based upon the criteria specified within the test procedure structure for evaluating conformance of Electronic Health Record (EHR) technology to the certification criteria as defined in 45 CFR Part 170 Subpart C of the Health Information Technology: Standards, Implementation Specifications, and Certification Criteria for Electronic Health Record Technology. The tasks focused on the twelve 2015 Edition certification criteria specified by ONC, specifically:

- Section 170.315(a)(1) Computerized provider order entry – medications
- Section 170.315(a)(2) Computerized provider order entry – laboratory
- Section 170.315(a)(3) Computerized provider order entry – diagnostic imaging
- Section 170.315(a)(4) Drug-drug, drug-allergy interaction checks
- Section 170.315(a)(5) Demographics
- Section 170.315(a)(6) Problem list
- Section 170.315(a)(7) Medication list
- Section 170.315(a)(8) Medication allergy list
- Section 170.315(a)(9) Clinical decision support
- Section 170.315(a)(14) Implantable device list
- Section 170.315(b)(2) Clinical information reconciliation and incorporation
- Section 170.315(b)(3) Electronic prescribing

A copy of the tasks presented to participants in the usability test of Credible Behavioral Health Software can be found in Appendix C.

Test Location

All participants were tested on the Credible Behavioral Health Software system during remote conferencing sessions using *Go to Meeting*. Each participant was requested in advance to secure a quiet room with minimal distractions and a desktop or laptop computer that could connect to the Internet with a *Go to Meeting* session. Although the type of computer, operating system and display resolution of the remote participant system was unknown, the system that was used by the test administrator and controlled by the remote participant was a Dell Inspiron Laptop running the Windows 10 professional operating system at a resolution of 1366x768 pixels. During a given *Go to Meeting* session, only the test administrator and participant communicated with one another.

The *Go to Meeting* usability test session was conducted by a test administrator from the testing organization (*The Usability People, LLC*) working from a small conference room at The Usability People's Fairfax, VA location. A data logger from the testing organization also took detailed notes on each session, including user comments and other ratings following each task. During a session both the test administrator and the data logger could see only the participant's screen and hear the participant's comments, questions, and responses.

Test Environment

While the EHRUT typically would be used in a behavioral healthcare office, inpatient or ambulatory center facility, testing of the Credible Behavioral Health Software system was conducted via remote connection during individual *Go to Meeting* sessions. Each participant called into a *Go to Meeting* session and was connected by the test administrator to the application.

The Credible Behavioral Health Software application itself ran on a web browser platform on a LAN connection using a sample database that was set up specifically for the test. Participants used a mouse and keyboard when interacting with the EHRUT and were given remote control of the administrator's workstation to perform the tasks.

Test Forms and Tools

As part of the usability test, several documents and instruments were used. Examples of the documents used during the usability test, including an informed consent form, the tasks, and post-test questionnaires, can be found in Appendices B to E, respectively.

Participants' interaction with the Credible Behavioral Health Software was captured and recorded digitally using the *Morae* screen capture software running on the test administrator's workstation. Verbal responses were recorded through either the microphone integrated into the participant's computer or through a telephone connection. This information was electronically transmitted to the administrator and to the data logger during each test session.

Participant Instructions

The administrator read the following instructions aloud to each participant:

Thank you for participating in this study. Your input is very important. Our session today will last about 60-90 minutes. During that time, you will use an instance of an electronic health record. I will ask you to complete a few tasks using this system and answer some questions.

Please note that we are not testing you; we are testing the system. Therefore, if you have any difficulty this may mean that something needs to be improved in the system. I will be here in case you need specific help, but I am not able to instruct you or provide help in how to use the application.

Overall, we are interested in how easy (or how difficult) this system is to use, what in it would be useful to you, and how we could improve it. I did not have any involvement in its creation, so please be honest with your opinions. All of the information that you provide will be kept confidential and your name will not be associated with your comments at any time. Should you feel it necessary you are able to withdraw at any time during the testing.

Participants were then given tasks to complete.

Procedure

Upon connection to the online meeting tool (*Go to Meeting*), each participant was greeted, his or her identity verified, and matched to a name on the participant schedule. Participant demographic information was also verified, including information regarding participant experience with the EHUT. Participant names were replaced with participant IDs so that a given individual's data cannot be linked to his/her identity. Prior to beginning testing, each participant reviewed and signed an informed consent form (See Appendix B).

Staff members of the *Usability People*, a usability test administrator administered the test. The administrator moderated the session by providing both verbal and written instructions for the overall usability test and for each of the tasks comprising the test. The administrator also monitored task success, path deviations, number and description of errors, and audio-recorded participant verbal comments. A data logger logged task times, obtained post-task rating data, and took notes on participant comments and administrator feedback.

For each of the twenty-nine (29) tasks, participants were provided written instructions to their computers. Following the administrator's instructions, each participant performed each task by first reading the task then stating in his or her own words his or her interpretation of the task requirements. When the participant's interpretation matched the actual goal of the task, the administrator instructed the participant to begin and task timing began. Task time was stopped and recorded when the test administrator observed on their workstation that the participant had successfully completed the task. If a participant failed to complete a task before the expected amount of time for each task, that task was marked as "Timed Out." After each task, the test administrator asked the participant, "On a scale from 1 to 5, where 1 is 'Very Difficult and 5 is 'Very Easy,' how satisfied were you with the ease of use for this task?" This same procedure was conducted for each of the twenty-nine (29) tasks.

Following completion of the twenty-nine (29) EHR tasks, the administrator electronically presented to the participant two post-test questionnaires (System Usability Scale (SUS), see Appendix D and Computer System Usability Questionnaire (CSUQ), see Appendix E). After the participant completed both questionnaires, the administrator thanked each participant for his or her time and allowed the participant to make any comments on or ask any questions about the system and/or the tasks presented. For each session, the participant's schedule, demographic information, task success rate, time on task, errors, deviations, verbal responses, and post-test questionnaire were digitally recorded. The system was then reset to proper test conditions for the next participant.

Usability Metrics

According to the *NIST Guide to the Processes Approach for Improving the Usability of Electronic Health Records* (NIST IR 7741, November, 2010) EHRs should support a process that provides a high level of usability for all users. The goal is for users to interact with the system effectively, efficiently, and with an acceptable level of satisfaction. To this end, metrics for effectiveness, efficiency and user satisfaction were captured during the usability testing. The goals of the test were to assess:

- Effectiveness of Credible Behavioral Health Software by measuring participant success rates and errors.
- Efficiency of Credible Behavioral Health Software by measuring the average task time and path deviations.
- Satisfaction with Credible Behavioral Health Software by measuring ease-of-use ratings.

Data Scoring

Table 2 details how tasks were scored, errors evaluated, and the time data analyzed:

Table 2. Scoring Protocols for Effectiveness, Efficiency, and Satisfaction

Measures	Rationale and Scoring
<p>Effectiveness:</p> <ul style="list-style-type: none"> • Task Success 	<p>A task was counted as “Success” if the participant was able to achieve the correct outcome, without assistance, within the time allotted on a per task basis.</p> <p>The total number of Successes was calculated for each task and then divided by the total number of times that task was attempted. Results are provided as a percentage.</p>
<p>Effectiveness:</p> <ul style="list-style-type: none"> • Task Failures 	<p>If the participant abandoned the task, did not reach the correct answer or performed it incorrectly, or reached the end of the allotted time before successful completion, the task was counted as “Fail.” No task times were taken for failed attempts.</p> <p>The total number of errors was calculated for each task and divided by the total number of times that task was attempted. Results are presented as the average error rate.</p> <p>Note: Not all deviations are counted as errors</p>
<p>Effectiveness:</p> <ul style="list-style-type: none"> • Prompted Successes 	<p>Because some tasks are dependent upon the successful completion of previous tasks, participants may receive a limited number of “prompts” to help prepare the system data for the pre-requisites for subsequent tasks.</p> <p>When a participant was able to complete the data entry on a task with 3 or fewer prompts, the task was counted as an “Assisted” completion. No task times were recorded for Assisted completions.</p>
<p>Efficiency:</p> <ul style="list-style-type: none"> • Task Deviations 	<p>The participant’s path (i.e., steps) through the application was recorded. Deviations occur if for example, the participant navigated to an incorrect screen, clicked on an incorrect menu item, followed an incorrect link, or interacted incorrectly with an on-screen control.</p>
<p>Efficiency:</p> <ul style="list-style-type: none"> • Task Time 	<p>Each task was timed from the administrator’s prompt “Begin” until said, “Done.” If the participant failed to say, “Done,” timing stopped when the participant stopped performing the task.</p> <p>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.</p>

<p>Satisfaction:</p> <ul style="list-style-type: none"> • Ease of Use ratings • System Satisfaction 	<p>Participant’s subjective impression of the ease of use of the application was measured by administering both a single post-task question as well as two post-session questionnaires.</p> <p>After each task, the participant determined on a scale of 1 to 5 their subjective satisfaction with performance on the task. These data are averaged across participants.</p> <p>To measure participants’ confidence in and likeability of the EHR overall, the testing team administered electronic versions of the System Usability Scale (SUS) and the Computer System Usability Questionnaire (CSUQ). See the SUS questionnaire as Appendix D., and the CSUQ as Appendix E.</p>
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Results

Data Analysis and Reporting

The results of the usability test of the Credible Behavioral Health Software system were analyzed according to the methods described in the Usability Metrics section above and are detailed below. Note that the results should be evaluated relative to the study objectives and goals, as outlined in the study design section above. The data should yield actionable results that, if corrected, yield material, positive impact on user performance.

Reliability

During the entire data collection phase, it was observed that the system provided a consistent and reliable interface to each participant as they completed their tasks. As each participant completed their assigned tasks, the system provided the same information and responded to their input with the same verbiage and using the same mode of communication (e.g. Pop-up message, or embedded assistance).

Effectiveness and Efficiency

Table 3 presents a summary of overall task performance showing task, mean time on task, task completion rates, mean path deviations and mean task satisfaction:

Table 3. Usability Test Results

Task	Mean Task Time	SD	Completion Rate (%)	Mean # Path Deviations	SD	Mean Task Satisfaction	SD
1.Demographics-Enter/Verify	1:41	0:26	100%	0.20	0.40	4.60	0.92
2.Demographics - Modify	1:12	0:20	100%	0.00	0.00	4.70	0.64
3.Problem List - Enter	2:05	0:37	100%	0.40	0.66	4.10	0.70
4.Problem List - Modify	0:31	0:07	100%	0.00	0.00	4.80	0.40
5.Problem List - Views	0:24	0:16	100%	0.00	0.00	4.50	0.92
6.CPOE Medication - Enter	1:39	0:49	100%	0.40	0.66	4.40	0.80
7.CPOE Medication - Modify	0:42	0:23	100%	0.10	0.30	4.40	1.02
8.CPOE Labs - Enter	1:15	0:54	80%	1.50	2.11	3.90	1.30
9.CPOE Labs - Modify	0:56	0:26	100%	0.50	1.02	4.50	0.81
10.CPOE Imaging - Enter	0:36	0:11	100%	0.00	0.00	4.50	0.81
11.CPOE Imaging - Modify	0:21	0:06	100%	0.00	0.00	4.60	0.66
12. Drug-Drug Interaction Check	0:42	0:15	100%	0.00	0.00	4.90	0.30
13.Drug-Allergy Interaction Check	0:53	0:20	100%	0.00	0.00	4.80	0.60
14.Drug/Allergy Interaction Adjustment	0:43	0:22	100%	0.30	0.64	4.80	0.40
15. Allergy list - View	0:17	0:07	100%	0.00	0.00	4.50	0.50
16. Allergy - Enter	0:38	0:14	100%	0.20	0.40	4.70	0.46
17. Clinical Decision Support - Problem List	0:38	0:29	100%	0.20	0.60	4.30	0.78
18. Clinical Decision Support - Medication List	0:10	0:09	100%	0.00	0.00	4.70	0.64
19. Clinical Decision Support - Combination	0:07	0:02	100%	0.00	0.00	4.70	0.64
20.Clinical Decision Support - Views	0:23	0:08	100%	0.00	0.00	4.80	0.40
21.Implantable Device List - Enter/View	0:54	0:16	100%	1.00	0.77	4.40	1.02
22.Implantable Device List - Modify	0:09	0:02	100%	0.00	0.00	4.90	0.30
23.Clinical Information Reconciliation & Incorporation	3:12	1:32	40%	4.30	2.05	2.80	1.25
24.CCDA View Reconciled Data	0:58	0:27	90%	1.10	1.76	3.90	1.04
25.Electronic Prescribing - Enter RX	1:21	0:26	100%	0.10	0.30	4.60	0.66
26.Electronic Prescribing - Modify RX	1:22	0:22	100%	0.40	0.66	4.70	0.64
27.Electronic Prescribing - Refill RX	0:33	0:11	100%	0.00	0.00	4.90	0.30
28.Electronic Prescribing - Views	1:06	0:26	100%	0.40	0.49	3.70	1.19
29.Electronic Prescribing - Cancel RX	0:23	0:06	100%	0.00	0.00	4.90	0.30

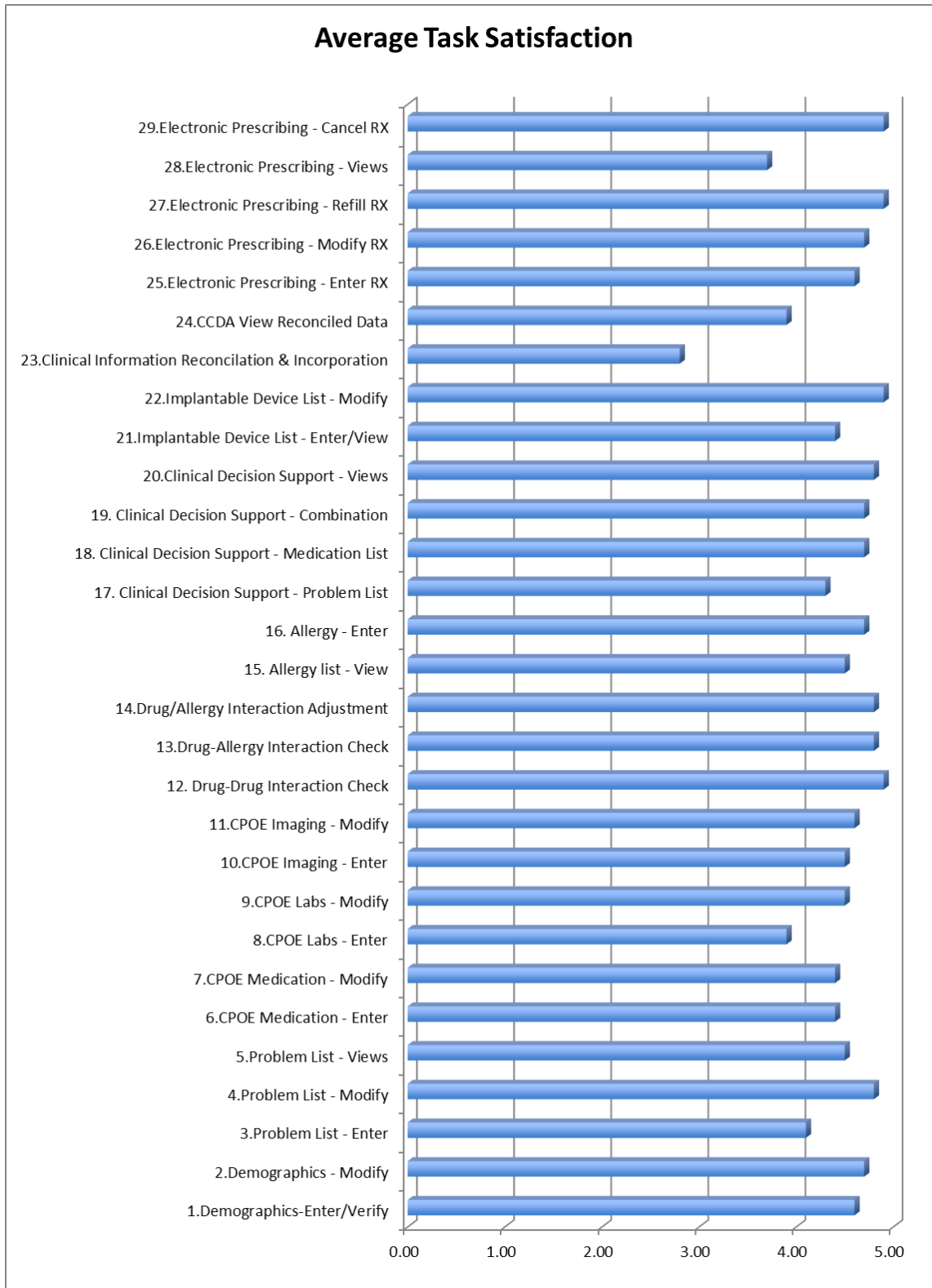
As Table 3 shows, relative to optimal performance standards as defined by Credible Behavioral Health and The Usability People, participant performance in the Credible Behavioral Health Software usability test was quite satisfactory. The overall average task completion rate was ninety-seven (97) percent.

Satisfaction

Individual Task Satisfaction

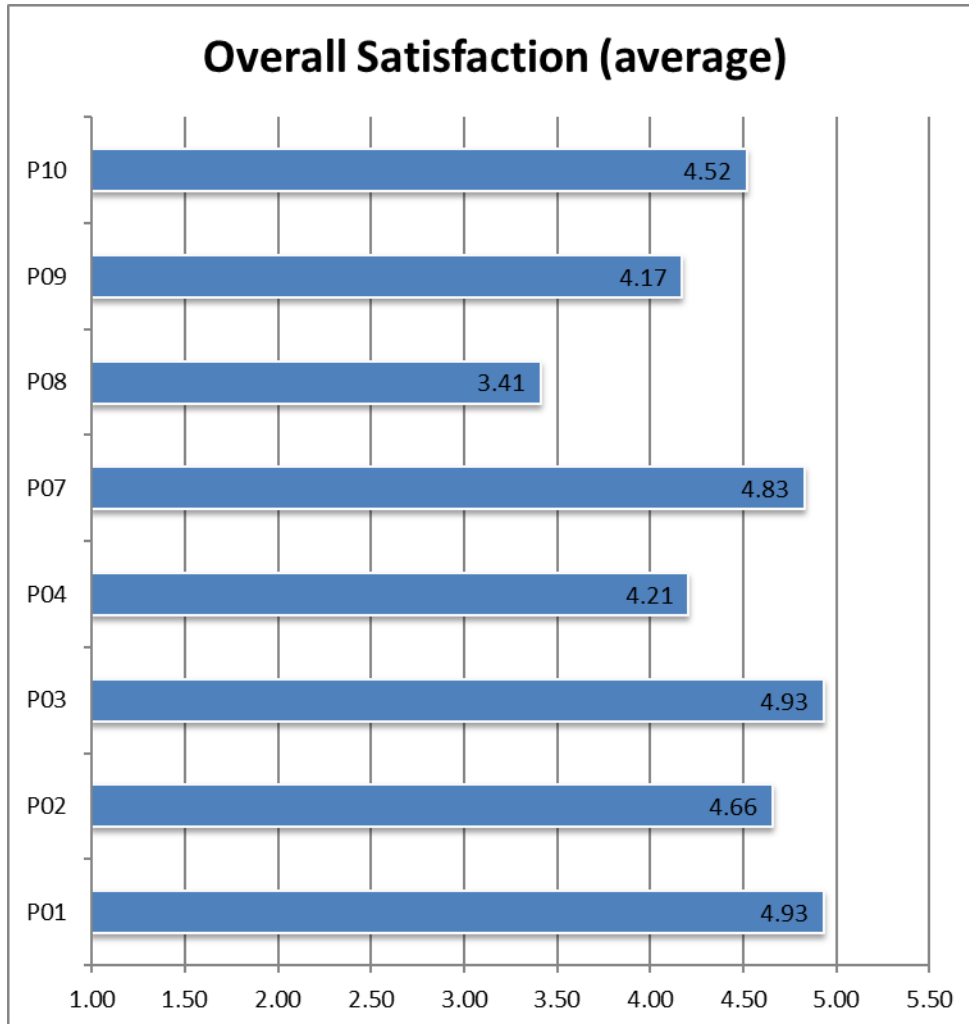
Participants verbally indicated their satisfaction with the ease of use for each task using a scale of “1” (“Very Difficult”) to “5,” (“Very Easy”). As Figure 1 shows individual task satisfaction ranged from a low of 2.8 out of 5 on Task 23 (*Clinical Information Reconciliation and Incorporation*) to a high of 4.9 out of 5 on Tasks 12, 22, 27, and 29 (Drug-Drug Interaction Check, Implantable Device List – Modify, Electronic RX – Refill, and Electronic RX Cancel RX).

Figure 1. Satisfaction Ratings of Individual Tasks



Individual Participant Satisfaction

In general, the participants were very satisfied with the ease of use of the Credible Behavioral Health Software system. The following chart displays overall satisfaction for each participant:



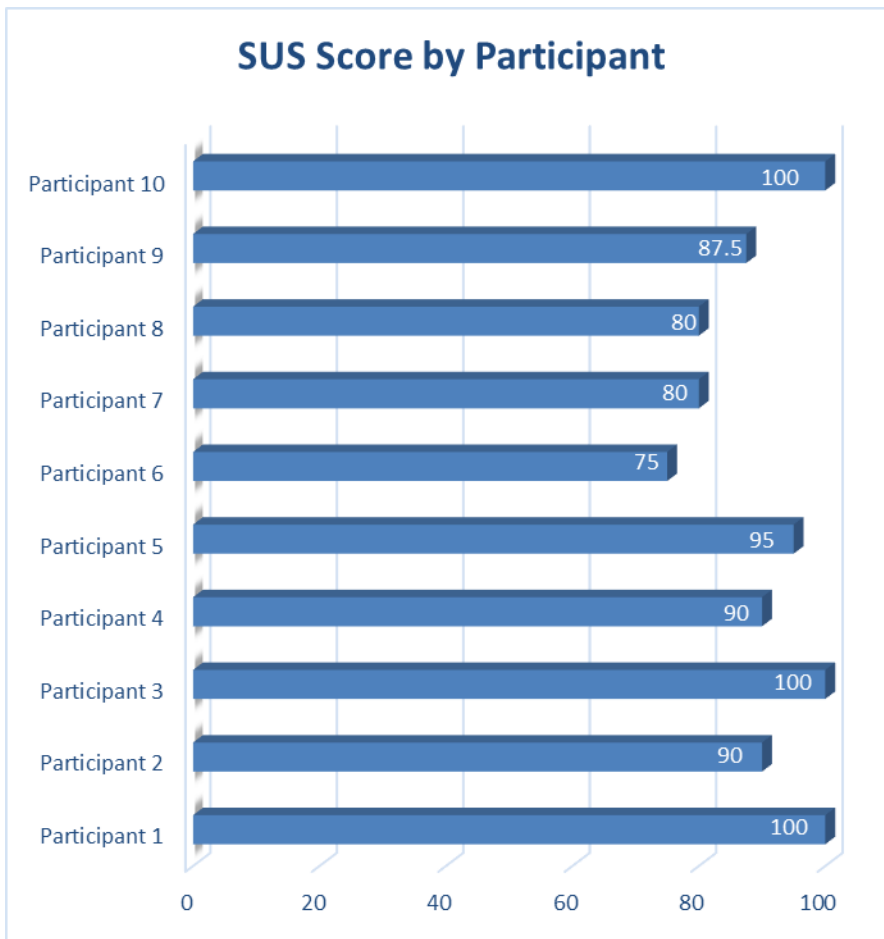
The average overall task satisfaction rate was 4.46 out of 5.

System Usability Scale

The System Usability Scale (SUS) is a simple, 10-item Likert-type attitude scale providing a global subjective assessment of usability from the user’s perspective (John Brooke at Digital Equipment Company developed the SUS in 1986). The SUS scale is scored from 0 to 100; scores under 60 represent systems with less than optimal usability, scores over 80 are considered better than average. See Appendix D for a copy of the SUS.

The mean total SUS score for Credible Behavioral Health Software was ninety (90) and ranged from a low of seventy-five (75) and a high of one hundred (100). Overall, participant-users rated their satisfaction with the Credible Behavioral Health Software system to be within the very high-range of a usable and satisfying EHR.

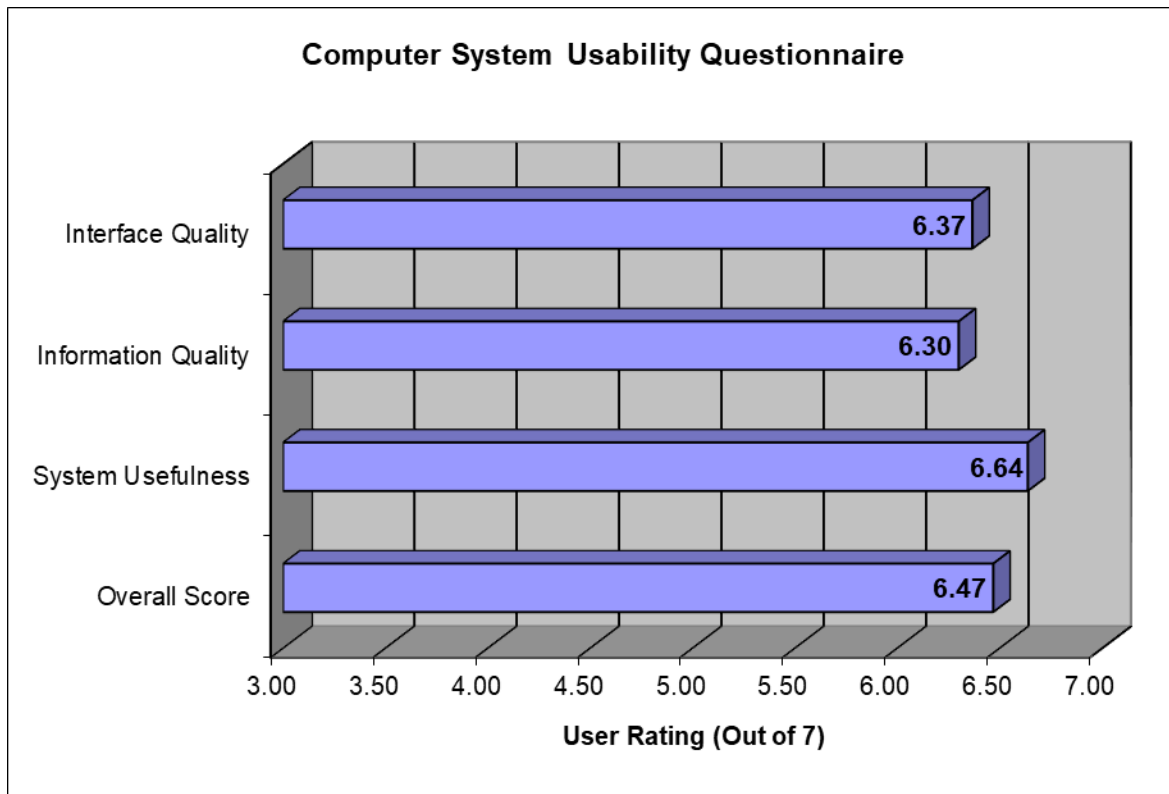
The following chart shows the SUS score by each participant:



Computer System Usability Questionnaire

Using the Computer System Usability Questionnaire (CSUQ; Lewis, J. R. (1995). (See: IBM Computer Usability Satisfaction Questionnaires: Psychometric Evaluation and Instructions for Use. International Journal of Human-Computer Interaction, 7:1, 57-78).), participants rated each of 19 items of the CSUQ questionnaire on a scale from 1 to 7, with a rating of 7 being most in agreement with the positively-worded item. Responses for each item were summed and averaged to four scales – Interface Quality, Information Quality, System Usefulness- and an overall scale. See Appendix E for a copy of the CSUQ.

Figure 2 displays CUSQ ratings for each of the four scales. In general, participants in the Credible Behavioral Health Software study rated system usability to be very high. On Interface Quality the average score for the participants was 6.37/7; on Information Quality the average score 6.30/7; on System Usefulness the average score was 6.64/7; and the overall average CUSQ score was 6.47/7.



Specific Task Result Details

Participant Number	1.Demographics-Enter/Verify			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	2:02	Success	0	5
P02	1:25	Success	0	2
P03	2:10	Success	1	5
P04	2:00	Success	0	5
P05	1:10	Success	0	5
P06	1:09	Success	0	4
P07	1:27	Success	0	5
P08	1:23	Success	0	5
P09	1:32	Success	0	5
P10	2:28	Success	1	5

Expected Time on Task	2:00	(SD)
Average Time on Task	1:41	0:26
Average Task Satisfaction	4.60	0.92
Average #Path Deviations	0.20	0.40
Percent Success	100%	

Participant Number	2.Demographics - Modify			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	1:35	Success	0	5
P02	0:50	Success	0	3
P03	1:05	Success	0	5
P04	1:09	Success	0	5
P05	0:59	Success	0	5
P06	1:02	Success	0	4
P07	0:47	Success	0	5
P08	1:50	Success	0	5
P09	1:10	Success	0	5
P10	1:36	Success	0	5

Expected Time on Task	1:00	(SD)
Average Time on Task	1:12	0:20
Average Task Satisfaction	4.70	0.64
Average #Path Deviations	0.00	0.00
Percent Success	100%	

Participant Number	3.Problem List - Enter			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	3:04	Success	0	4
P02	1:29	Success	2	5
P03	3:11	Success	0	4
P04	2:01	Success	0	4
P05	1:45	Success	0	5
P06	2:17	Success	1	3
P07	2:12	Success	1	4
P08	1:14	Success	0	5
P09	1:32	Success	0	3
P10	2:09	Success	0	4

Expected Time on Task	2:00	(SD)
Average Time on Task	2:05	0:37
Average Task Satisfaction	4.10	0.70
Average #Path Deviations	0.40	0.66
Percent Success	100%	

Participant Number	4.Problem List - Modify			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	0:41	Success	0	5
P02	0:33	success	0	5
P03	0:32	Success	0	5
P04	0:43	Success	0	5
P05	0:29	Success	0	5
P06	0:25	Success	0	4
P07	0:32	Success	0	5
P08	0:22	Success	0	5
P09	0:21	Success	0	5
P10	0:33	Success	0	4

Expected Time on Task	1:00	(SD)
Average Time on Task	0:31	0:07
Average Task Satisfaction	4.80	0.40
Average #Path Deviations	0.00	0.00
Percent Success	100%	

Participant Number	5.Problem List - Views			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	0:26	Success	0	5
P02	0:09	Success	0	5
P03	1:02	Success	0	5
P04	0:32	Success	0	2
P05	0:19	Success	0	5
P06	0:08	Success	0	4
P07	0:08	Success	0	5
P08	0:33	Success	0	4
P09	0:28	Success	0	5
P10	0:16	Success	0	5

Expected Time on Task	0:30	(SD)
Average Time on Task	0:24	0:16
Average Task Satisfaction	4.50	0.92
Average #Path Deviations	0.00	0.00
Percent Success	100%	

Participant Number	6.CPOE Medication - Enter			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	3:10	Success	2	5
P02	1:23	Success	0	4
P03	1:18	Success	0	5
P04	2:00	Success	1	4
P05	2:42	Success	0	5
P06	1:56	Success	1	3
P07	0:41	Success	0	3
P08	0:57	Success	0	5
P09	0:31	Success	0	5
P10	1:55	Success	0	5

Expected Time on Task	2:00	(SD)
Average Time on Task	1:39	0:49
Average Task Satisfaction	4.40	0.80
Average #Path Deviations	0.40	0.66
Percent Success	100%	

Participant Number	7.CPOE Medication - Modify			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	1:08	Success	0	5
P02	0:24	Success	0	5
P03	1:12	Success	0	5
P04	1:14	Success	0	4
P05	0:14	Success	0	5
P06	0:53	Success	1	2
P07	0:15	Success	0	3
P08	0:36	Success	0	5
P09	0:16	Success	0	5
P10	0:53	Success	0	5

Expected Time on Task	0:30	(SD)
Average Time on Task	0:42	0:23
Average Task Satisfaction	4.40	1.02
Average #Path Deviations	0.10	0.30
Percent Success	100%	

Participant Number	8.CPOE Labs - Enter			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	1:10	Success	0	5
P02	0:52	Success	0	5
P03	1:22	Success	1	4
P04	1:44	Success	1	5
P05	1:09	Success	0	5
P06	3:22	Fail	5	2
P07	1:39	Success	2	2
P08	3:23	Fail	6	2
P09	0:46	Success	0	5
P10	1:15	Success	0	4

Expected Time on Task	2:00	(SD)
Average Time on Task	1:15	0:54
Average Task Satisfaction	3.90	1.30
Average #Path Deviations	1.50	2.11
Percent Success	80%	

Participant Number	9.CPOE Labs - Modify			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	1:25	Success	0	5
P02	0:44	Success	0	5
P03	0:35	Success	0	5
P04	1:22	Success	0	5
P05	0:31	Success	0	5
P06	1:03	Success	2	3
P07	0:43	Success	0	3
P08	1:48	Success	3	5
P09	0:28	Success	0	5
P10	0:43	Success	0	4

Expected Time on Task	1:00	(SD)
Average Time on Task	0:56	0:26
Average Task Satisfaction	4.5	0.81
Average #Path Deviations	0.50	1.02
Percent Success	100%	

Participant Number	10.CPOE Imaging - Enter			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	0:56	Success	0	5
P02	0:22	Success	0	5
P03	0:27	Success	0	5
P04	0:24	Success	0	5
P05	0:39	Success	0	5
P06	0:32	Success	0	3
P07	0:29	Success	0	3
P08	0:43	Success	0	5
P09	0:52	Success	0	5
P10	0:32	Success	0	4

Expected Time on Task	1:00	(SD)
Average Time on Task	0:36	0:11
Average Task Satisfaction	4.5	0.81
Average #Path Deviations	0	0.00
Percent Success	100%	

Participant Number	11.CPOE Imaging - Modify			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	0:18	Success	0	5
P02	0:15	Success	0	5
P03	0:18	Success	0	5
P04	0:23	Success	0	5
P05	0:17	Success	0	5
P06	0:27	Success	0	4
P07	0:18	Success	0	3
P08	0:20	Success	0	5
P09	0:20	Success	0	5
P10	0:35	Success	0	4

Expected Time on Task	0:30	(SD)
Average Time on Task	0:21	0:06
Average Task Satisfaction	4.60	0.66
Average #Path Deviations	0.00	0.00
Percent Success	100%	

Participant Number	12. Drug-Drug Interaction Check			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	0:49	Success	0	5
P02	0:27	Success	0	5
P03	0:48	Success	0	5
P04	1:18	Success	0	5
P05	0:34	Success	0	5
P06	0:22	Success	0	4
P07	0:34	Success	0	5
P08	0:42	Success	0	5
P09	0:47	Success	0	5
P10	0:37	Success	0	5

Expected Time on Task	1:30	(SD)
Average Time on Task	0:42	0:15
Average Task Satisfaction	4.90	0.30
Average #Path Deviations	0.00	0.00
Percent Success	100%	

Participant Number	13. Drug-Allergy Interaction Check			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	0:28	Success	0	5
P02	0:43	Success	0	5
P03	1:28	Success	0	5
P04	0:48	Success	0	5
P05	0:42	Success	0	5
P06	0:55	Success	0	3
P07	0:51	Success	0	5
P08	1:34	Success	0	5
P09	0:41	Success	0	5
P10	0:40	Success	0	5

Expected Time on Task	1:00	(SD)
Average Time on Task	0:53	0:20
Average Task Satisfaction	4.80	0.60
Average #Path Deviations	0.00	0.00
Percent Success	100%	

Participant Number	14. Drug/Allergy Interaction Adjustment			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	0:43	Success	0	5
P02	0:29	Success	0	5
P03	0:53	Success	2	5
P04	0:57	Success	0	4
P05	0:21	Success	0	5
P06	1:04	Success	1	4
P07	0:17	Success	0	5
P08	1:28	Success	0	5
P09	0:24	Success	0	5
P10	0:29	Success	0	5

Expected Time on Task	0:30	(SD)
Average Time on Task	0:43	0:22
Average Task Satisfaction	4.80	0.40
Average #Path Deviations	0.30	0.64
Percent Success	100%	

Participant Number	15. Allergy list - View			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	0:22	Success	0	5
P02	0:05	Success	0	5
P03	0:13	Success	0	5
P04	0:15	Success	0	4
P05	0:09	Success	0	5
P06	0:26	Success	0	4
P07	0:19	Success	0	4
P08	0:26	Success	0	4
P09	0:16	Success	0	4
P10	0:14	Success	0	5

Expected Time on Task	0:30	(SD)
Average Time on Task	0:17	0:07
Average Task Satisfaction	4.50	0.50
Average #Path Deviations	0.00	0.00
Percent Success	100%	

Participant Number	16. Allergy - Enter			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	0:51	Success	0	5
P02	0:51	Success	1	5
P03	1:08	Success	0	5
P04	0:31	Success	0	5
P05	0:32	Success	0	5
P06	0:24	Success	0	4
P07	0:39	Success	1	4
P08	0:31	Success	0	5
P09	0:28	Success	0	4
P10	0:24	Success	0	5

Expected Time on Task	0:45	(SD)
Average Time on Task	0:38	0:14
Average Task Satisfaction	4.70	0.46
Average #Path Deviations	0.20	0.40
Percent Success	100%	

Participant Number	17. Clinical Decision Support - Problem List			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	2:05	Success	2	5
P02	0:26	Success	0	5
P03	0:27	Success	0	5
P04	0:35	Success	0	3
P05	0:22	Success	0	4
P06	0:32	Success	0	3
P07	0:24	Success	0	4
P08	0:20	Success	0	5
P09	0:38	Success	0	5
P10	0:35	Success	0	4

Expected Time on Task	0:30	(SD)
Average Time on Task	0:38	0:29
Average Task Satisfaction	4.30	0.78
Average #Path Deviations	0.20	0.60
Percent Success	100%	

Participant Number	18. Clinical Decision Support - Medication List			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	0:19	Success	0	5
P02	0:10	Success	0	5
P03	0:32	Success	0	5
P04	0:07	Success	0	4
P05	0:09	Success	0	5
P06	0:05	Success	0	3
P07	0:04	Success	0	5
P08	0:04	Success	0	5
P09	0:06	Success	0	5
P10	0:04	Success	0	5

Expected Time on Task	0:30	(SD)
Average Time on Task	0:10	0:09
Average Task Satisfaction	4.70	0.64
Average #Path Deviations	0.00	0.00
Percent Success	100%	

Participant Number	19. Clinical Decision Support - Combination			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	0:07	Success	0	5
P02	0:10	Success	0	5
P03	0:04	Success	0	5
P04	0:09	Success	0	4
P05	0:09	Success	0	5
P06	0:06	Success	0	3
P07	0:04	Success	0	5
P08	0:06	Success	0	5
P09	0:06	Success	0	5
P10	0:05	Success	0	5

Expected Time on Task	0:30	(SD)
Average Time on Task	0:07	0:02
Average Task Satisfaction	4.70	0.64
Average #Path Deviations	0.00	0.00
Percent Success	100%	

Participant Number	20.Clinical Decision Support - Views			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	0:15	Success	0	5
P02	0:21	Success	0	5
P03	0:37	Success	0	5
P04	0:24	Success	0	5
P05	0:15	Success	0	5
P06	0:34	Success	0	4
P07	0:18	Success	0	5
P08	0:32	Success	0	4
P09	0:15	Success	0	5
P10	0:20	Success	0	5

Expected Time on Task	0:30	(SD)
Average Time on Task	0:23	0:08
Average Task Satisfaction	4.80	0.40
Average #Path Deviations	0.00	0.00
Percent Success	100%	

Participant Number	21.Implantable Device List - Enter/View			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	0:48	Success	0	5
P02	1:23	Success	2	5
P03	0:50	Success	0	5
P04	1:19	Success	1	2
P05	0:39	Success	0	5
P06	0:39	Success	1	3
P07	0:44	Success	2	4
P08	0:37	Success	1	5
P09	0:51	Success	2	5
P10	1:12	Success	1	5

Expected Time on Task	2:00	(SD)
Average Time on Task	0:54	0:16
Average Task Satisfaction	4.40	1.02
Average #Path Deviations	1.00	0.77
Percent Success	100%	

Participant Number	22.Implantable Device List - Modify			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	0:07	Success	0	5
P02	0:12	Success	0	5
P03	0:11	Success	0	5
P04	0:08	Success	0	5
P05	0:08	Success	0	5
P06	0:07	Success	0	4
P07	0:13	Success	0	5
P08	0:06	Success	0	5
P09	0:08	Success	0	5
P10	0:10	Success	0	5

Expected Time on Task	0:30	(SD)
Average Time on Task	0:09	0:02
Average Task Satisfaction	4.9	0.30
Average #Path Deviations	0.00	0.00
Percent Success	100%	

Participant Number	23.Clinical Information Reconciliation & Incorporation			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	4:19	Success	3	4
P02	2:17	Success	1	4
P03	2:24	Success	1	5
P04	3:47	Success	3	3
P05	4:06	Fail	6	3
P06	4:28	Fail	7	2
P07	7:17	Fail	6	1
P08	3:12	Fail	5	2
P09	6:05	Fail	6	1
P10	2:34	Fail	5	3

Expected Time on Task	3:00	(SD)
Average Time on Task	3:12	1:32
Average Task Satisfaction	2.8	1.25
Average #Path Deviations	4.3	2.05
Percent Success	40%	

Participant Number	24.CCDA View Reconciled Data			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	1:50	Success	4	5
P02	0:32	Success	0	5
P03	1:15	Success	0	5
P04	0:39	Success	0	3
P05	0:31	Success	0	5
P06	0:39	Success	0	3
P07	1:24	Success	1	4
P08	1:35	Fail	5	2
P09	0:42	Success	0	3
P10	1:07	Success	1	4

Expected Time on Task	1:00	(SD)
Average Time on Task	0:58	0:27
Average Task Satisfaction	3.90	1.04
Average #Path Deviations	1.10	1.76
Percent Success	90%	

Participant Number	25.Electronic Prescribing - Enter RX			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	1:10	Success	0	5
P02	0:32	Success	1	3
P03	1:07	Success	0	5
P04	1:10	Success	0	5
P05	1:34	Success	0	5
P06	1:27	Success	0	4
P07	0:58	Success	0	5
P08	2:10	Success	0	5
P09	1:47	Success	0	4
P10	1:35	Success	0	5

Expected Time on Task	1:30	(SD)
Average Time on Task	1:21	0:26
Average Task Satisfaction	4.60	0.66
Average #Path Deviations	0.10	0.30
Percent Success	100%	

Participant Number	26.Electronic Prescribing - Modify RX			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	1:03	Success	0	5
P02	1:58	Success	2	4
P03	1:05	Success	0	5
P04	1:35	Success	1	5
P05	1:03	Success	0	5
P06	1:39	Success	0	3
P07	0:49	Success	0	5
P08	1:47	Success	0	5
P09	1:04	Success	0	5
P10	1:34	Success	1	5

Expected Time on Task	1:00	(SD)
Average Time on Task	1:22	0:22
Average Task Satisfaction	4.7	0.64
Average #Path Deviations	0.4	0.66
Percent Success	100%	

Participant Number	27.Electronic Prescribing - Refill RX			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	0:28	Success	0	5
P02	0:32	Success	0	5
P03	0:31	Success	0	5
P04	0:27	Success	0	5
P05	0:52	Success	0	5
P06	0:26	Success	0	4
P07	0:22	Success	0	5
P08	0:55	Success	0	5
P09	0:32	Success	0	5
P10	0:27	Success	0	5

Expected Time on Task	0:30	(SD)
Average Time on Task	0:33	0:11
Average Task Satisfaction	4.90	0.30
Average #Path Deviations	0.00	0.00
Percent Success	100%	

Participant Number	28.Electronic Prescribing - Views			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	0:30	Success	0	5
P02	0:31	Success	0	5
P03	0:45	Success	0	5
P04	1:57	Success	1	1
P05	1:28	Success	0	3
P06	1:13	Success	1	3
P07	1:15	Success	0	4
P08	0:50	Success	0	3
P09	1:03	Success	1	4
P10	1:26	Success	1	4

Expected Time on Task	1:00	(SD)
Average Time on Task	1:06	0:26
Average Task Satisfaction	3.70	1.19
Average #Path Deviations	0.40	0.49
Percent Success	100%	

Participant Number	29.Electronic Prescribing - Cancel RX			
	Task Time	Outcome	# Path Deviations	Task Satisfaction
P01	0:31	Success	0	5
P02	0:32	Success	0	5
P03	0:22	Success	0	5
P04	0:17	Success	0	5
P05	0:23	Success	0	5
P06	0:10	Success	0	4
P07	0:19	Success	0	5
P08	0:22	Success	0	5
P09	0:26	Success	0	5
P10	0:23	Success	0	5

Expected Time on Task	0:30	(SD)
Average Time on Task	0:23	0:06
Average Task Satisfaction	4.90	0.30
Average #Path Deviations	0.00	0.00
Percent Success	100%	

Discussion of Findings

In general, the participants performed very well and felt satisfied with the Credible Behavioral Health Software system. A few of the participants struggled with some portions of a few tasks but in general most were able to successfully complete a majority of the tasks with little or no difficulty. Participants were mostly able to perform all tasks successfully on their own with no assistance or external documentation. The participant average performance rate was high, as were the overall participant satisfaction rates. The Credible Behavioral Health Software system appears to be a usable EHR.

Effectiveness

Of the twenty-nine (29) tasks presented, a large majority of the tasks were successfully completed by all of the participants. Over all of participants, the mean successful task competition rate was high with an overall average rate of ninety-seven (97) percent indicating that in general the participants had little or no difficulty completing the tasks.

The amount of prior experience with EHR systems and with Credible Behavioral Health Software was only slightly related to successful task performance and error rates; participants with more prior experience were more slightly likely to successfully complete tasks with less errors than those with less prior experience.

Efficiency

Participants who successfully completed tasks generally completed those tasks within an acceptable time. Some tasks were completed more quickly than the calculated optimal time, while several tasks took slightly longer than expected. The tasks that took the longest required the participants to navigate to a particular unfamiliar portion of a page, interact with a workflow, locate and select specific actions. Those tasks may be performed more quickly with a minor update to the user interface and/or the user experience.

Some participants made errors when attempting to navigate toward solving their assigned tasks. These errors may be associated with those participants not being familiar with new features and not understanding the presented workflow of the Credible Behavioral Health Software system. As noted above, prior experience with EHR systems was related to successful task completion.

Satisfaction

Participants were very satisfied with the Credible Behavioral Health Software system; ratings on the SUS (mean = 90 out of a possible 100) and the CSUQ (Overall score = 6.47 out of a possible 7.0) demonstrated a very high level of satisfaction with the system.

On the CSUQ, participants ranked the scale "(System Usefulness)" highest of the three scales, suggesting that the system provided an effective and efficient user interface. Individual task satisfaction ratings were related to individual user performance. Those participants who were able to successfully complete tasks were also more likely to rank those tasks as satisfying, while those participants who did poorly or were not able to complete a task ranked those tasks as less satisfying. Overall however, the high participant satisfaction with Credible Behavioral Health Software was expected given the task performance data.

Summary of Major Findings

This evaluation demonstrated that the Credible Behavioral Health Software system is a usable system with a relatively short learning curve. Participants with minimal amounts of experience using the Credible system experienced very little difficulty understanding the navigation and information architecture. Participants with more experience were able to solve most tasks without difficulty or error.

Risk Analysis

The following table presents a list of tasks presented with the risk of error as observed during the testing.

Table 5. Risk Analysis

Task	Description	Percent Complete	Risk Status
1.Demographics-Enter/Verify	Verify and Enter Demographics Information	100%	None
2.Demographics - Modify	Modify Demographic Information	100%	None
3.Problem List - Enter	Enter Diagnosis	100%	None
4.Problem List - Modify	Modify Diagnosis	100%	None
5.Problem List - Views	View Historical Problem list	100%	None
6.CPOE Medication - Enter	Enter Medication	100%	None
7.CPOE Medication - Modify	Modify Medication	100%	None
8.CPOE Labs - Enter	Enter Lab Order	80%	Low
9.CPOE Labs - Modify	Modify Lab Order	100%	None
10.CPOE Imaging - Enter	Enter Radiology Order	100%	None
11.CPOE Imaging - Modify	Modify Radiology Order	100%	None
12. Drug-Drug Interaction Check	View Drug-Drug Interaction Warning	100%	None
13.Drug-Allergy Interaction Check	View Drug-Allergy Interaction Warning	100%	None
14.Drug/Allergy Interaction Adjustment	Adjust Drug/Allergy Severity	100%	None
15. Allergy list - View	View Patient Allergy List	100%	None
16. Allergy - Enter	Add Allergy to list	100%	None
17. Clinical Decision Support - Problem List	View CDS information for problem	100%	None
18. Clinical Decision Support - Medication List	View CDS Information for Medications	100%	None

19. Clinical Decision Support - Combination	View CDS information for combination issue	100%	None
20. Clinical Decision Support - Views	View CDS Details	100%	None
21. Implantable Device List - Enter/View	Enter and view attributes of an Implantable device	100%	None
22. Implantable Device List - Modify	Modify an Implantable Device	100%	None
23. Clinical Information Reconciliation & Incorporation	View and incorporate a CCDA document	40%	High
24. CCDA View Reconciled Data	View CCDA document	90%	Low
25. Electronic Prescribing - Enter RX	Electronically prescribe a drug	100%	None
26. Electronic Prescribing - Modify RX	Modify an eRx Prescription	100%	None
27. Electronic Prescribing - Refill RX	Satisfy a refill request	100%	None
28. Electronic Prescribing - Views	View eRX details	100%	None
29. Electronic Prescribing - Cancel RX	Cancel an eRX	100%	None

Areas for Improvement

The following is a partial list of potential areas for improvement. Making these and other minor enhancements will improve the overall user experience of the Credible Behavioral Health Software system and increase the effectiveness, efficiency, and satisfaction for both experienced and novice users.

- **Indication of Required Fields**
 - A frequent error was caused when participants attempted to submit a form within the Credible interface that contained required fields that were not completed. This is likely because the system did not provide a clear indication of which fields are required. Adding a consistent visual indication of required fields would likely eliminate many of these errors observed.
- **Inconsistent “Add,” “Update” and other functions**
 - Many errors occurred when users attempted to perform an “Add” or “Update” function. The system provided several different user interaction patterns across several different functional areas. Providing a consistent user interface and user experience across the entire application may help to reduce user errors.
- **Inconsistent User Interface and User Experience**
 - Several errors occurred when the users attempted to perform an action using a user experience pattern that existed in one functional area, but this pattern did not work in the current functional area. Creating a User Experience and a user interface that is consistent across all functional areas would help to improve the overall user experience of the system.

Appendices

Appendix A: Recruiting Screener

1. Are you male or female?
2. Have you participated in a focus group or usability test in the past 6 months?
3. Do you, or does anyone in your home work in marketing research, usability research, and/or web design?
4. Do you, or does anyone in your home, have a commercial or research interest in an electronic health record software or consulting company?
5. Which of the following best describes your age?

20-29, 30-39, 40-49, 50-59, 60-69, 70-79, 80-89, 90-99, 100 and older.
6. Which of the following best describes your education level?
 - No high school diploma
 - High school graduate, diploma or the equivalent
 - 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)
7. Do you require any assistive technologies to use a computer?
8. Please describe your medical or nursing credentials
9. What is your current job title?
10. How long have you held this position? (number of years):
11. What type of facility do you work in and what is your role there?
12. How are medical records handled at your (main) workplace?

All Paper Some Paper/Some Electronic All Electronic
13. How many EHRs do you use or have you worked with?
14. How many years have you used an electronic health record?
15. How many years have you used the Credible system?

16. How many years have you used computers?

17. About how many hours per week do you spend using a computer?

18. What computer platform(s) do you usually use?

19. In the last month, about how often have you used an electronic health record?

___ Did not use last month

___ Every day

___ A few times a week.

Appendix B: Informed Consent Form

The Usability People would like to thank you for participating in this study. The purpose of this study is to evaluate an electronic health records system. If you decide to participate, you will be asked to perform several tasks using the prototype and give your feedback. The study will last about 60 minutes.

Agreement

I understand and agree that as a voluntary participant in the present study conducted by The Usability People. I am free to withdraw consent or discontinue participation at any time. I understand and agree to participate in the study conducted and recorded by The Usability People.

I understand and consent to the use and release of the video recording by The Usability People. I understand that the information and video is for research purposes only and that my name and image will not be used for any purpose other than research. I relinquish any rights to the video and understand the video recording may be copied and used by The Usability People without further permission.

I understand and agree that the purpose of this study is to make software applications more useful and usable in the future.

I understand and agree that the data collected from this study may be shared outside of The Usability People. I understand and agree that data confidentiality is assured, because only de-identified data – i.e., identification numbers not names – will be used in analysis and reporting of the results.

I agree to immediately raise any concerns or areas of discomfort with the study administrator. I understand that I can leave at any time.

Please check one of the following:

YES, I have read the above statement and agree to be a participant.

NO, I choose not to participate in this study.

Signature: _____ **Date** _____

Appendix C: Participant Guide

ORIENTATION and INTRODUCTION

Thank you for participating in this study. The session today will last approximately 60-90 minutes. During this session, you will look at a special version of the Credible Behavioral Health software. The product you will be using today may not be exactly like the software that you may be used to. Some of the data may not make sense, as it is merely placeholder data.

The purpose of this study is to gauge the *usability* of the software. We are interested in how easy (or how difficult) this version is to use, and learning about which of the features and benefits would be most useful to you. We also want to know how we could improve it.

The moderator will guide you through the testing process. Please use the software as you would in a real clinical setting. You will be asked to save your comments until the end of a task or the end of the session to discuss your thoughts freely.

Here are some things you should know about your participation in this session:

- The Moderator will guide you through each task.
- **Please do not work ahead.**
- If you notice an error, just cancel out and continue to the task. If you feel lost or have difficulty completing the scenario, please inform the Moderator.
- The Testing session will be recorded for further study.
- All information will be kept confidential. Your name will not be associated with your comments at any time.

Fictitious scenarios have been created and pre-loaded in the system software. The Moderator will ask you to complete several tasks using the system. You will be asked to answer some questions and to complete some tasks on your own. Try to complete tasks as quickly as possible, with the fewest possible errors or deviations.

Please do not do anything more than asked.

Demographic Information

Your client, <Client Name>, has arrived for their scheduled appointment. They have been referred to our organization by a primary care physician for issues related to drug addiction.

On the intake form, the client listed Duloxetine 30 mg once a day oral, and Suboxone 12 mg-3 mg sublingual film once a day as medication.

The client also indicated that he bruises easily, is allergic to penicillin, and indicated he recently stopped injecting heroin. The intake nurse follows up on the penicillin allergy and indicates the symptoms were a facial rash along with flushing and that these allergies were mild in severity. The client also reveals taking ibuprofen for headaches about once a week.

Task 1 (a.5) Demographics

Before beginning their treatment, you need to verify or enter some of the demographic information that is stored within the system

<i>Language</i>	Preferred Language 'Korean'
<i>Date of Birth</i>	06/17/1980
<i>Birth Sex</i>	Male
<i>Sexual Orientation</i>	'Heterosexual'
<i>Gender Identity</i>	'Male'
<i>Client Ethnicity</i>	'Not Hispanic or Latino'
<i>Client Race</i>	'Asian'

Verify and/or Enter and save this information into the EHR. Verify that the changes have been saved.

Task 2. (a.5) Demographics - Change

After talking with the client about the information that is entered into the EHR, the client verbally indicates that the following changes are needed:

Language	English
Date of Birth	12/10/1975
Birth Sex	Female
Race	African American,
Ethnicity	Not Hispanic or Latino
Sexual Orientation	Choose not to disclose (ASKU)
Gender identity	Female

Make any necessary changes and Enter or Verify that this information is saved into the EHR.

Task 3 (a.6) Problem List.

During the evaluation, the psychiatrist agrees with the primary care physician's diagnosis of:

(F33.2) Major depressive disorder, recurrent severe without psychotic features and

(F11.19) Opioid abuse with unspecified opioid-induced disorder.

Add those diagnoses into this client's record.

Additionally, during the review of systems the psychiatrist notes some bumps on the client's elbow and adds:

(S50.329A) Blister (nonthermal) of unspecified elbow, initial encounter to the problem list.

Verify and/or Enter and save this information into the EHR. Verify that the changes have been saved.

Task 4 (a.6) Problem List - Change

The psychiatrist asks the nurse practitioner to look at the marks on the client's arms. The nurse practitioner determines the marks are insect bites that have become infected. Use the system to update the problem list to contain the diagnosis of

(S50.36) Insect bite (nonvenomous) of elbow.

Verify and/or Enter and save this information into the EHR. Verify that the changes have been saved.

Task 5 (a.6) Problem List – Views

Please view the active problem list and confirm that it now indicates:

(F33.2) Major depressive disorder, recurrent severe without psychotic features,

(F11.19) Opioid abuse with unspecified opioid-induced disorder, and

(S50.36) Insect bite (nonvenomous) of elbow.

Notice that when you display the historical problem list the

(S50.329A) Blister (nonthermal) of unspecified elbow, initial encounter appears in their History.

View the active problem list and verify that the historical problem list has been displayed.

Task 6 (a.1) Record medication

The client's medication list shows that the Duloxetine 30 mg once a day oral has already been entered into the system.

Please add the following medication to their medication list:

Suboxone 12 mg-3 mg sublingual film,

as a current medication once a day.

Verify and/or Enter and save this information into the EHR.

Task 7 (a.1) Change medication

During the initial session with the psychiatrist, the client states that the Duloxetine is actually taken twice per day. This is supported by the primary care physician's notes.

Update the order for Duloxetine to reflect a twice daily administration.

Verify and/or Enter and save this information into the EHR. Verify that the changes have been saved.

Task 8 (a.2) Record a Lab order

All new clients with a physician referral to Credible for drug use are scheduled for normal drug screening panel. After meeting with the client, order:

'Drugs of Abuse 5 Random Urine' Screen Panel with a Due Date of **Dec 30, 2017**.

Verify and/or Enter and save this lab request into the EHR. Verify that any changes have been saved.

Task 9 (a.2) Change Lab order

Upon reviewing the lab order just entered, you realize that the Due Date of Dec 30, 2017, is too many days away.

You need to change the Due Date to **Dec 20, 2017**.

Verify and/or Enter and save this information into the EHR. Verify that the changes have been saved.

Task 10 (a.3) Diagnostic Imaging order

The psychiatrist noticed that the client exhibited some speech and facial abnormalities that could be either stroke or apraxia and wants to create a Radiology Order for a brain imaging study.

Order a **CT scan with contrast** and select '**NOW**' as the Severity level.

Verify and/or Enter and save this information into the EHR. Verify that the changes have been saved.

Task 11 (a.3) Change Diagnostic Imaging order

The psychiatrist comes back in stating the severity level must be changed to '**STAT**' because the client is exhibiting stroke-like symptoms.

Change the Severity level of the Radiology Order from '**NOW**' to '**STAT**', and then view the client's record to verify the CT scan with contrast order now displays a **STAT** severity level.

Task 12 (a.4) Drug-drug interaction check

The client reports an increase in depression and anxiety. As a result, a new drug is added to the drug therapy component of the client's care.

Add the Medication '**Isocarboxazid 10 mg**' per day using the EHR system

The system will display a warning message regarding this new medication. Optionally review the warning details and then continue with the selection.

Verify and/or Enter and save this information into the EHR. Verify that the changes have been saved.

Task 13 (a.4) Drug-allergy interaction check

The client returns for a regularly scheduled appointment and presented with infected sores on his left forearm. The Dr. added the medication:

Penicillin V potassium 125 mg/ 5 mL oral solution 3 times per day for the infection.

The system will display a warning message regarding this new medication. Review the warning and then continue with the order.

Verify and/or Enter and save this information into the EHR. Verify that the changes have been saved.

Task 14 (a.4) Drug/Allergy interaction adjustment

During the visit, the client reports breaking out in bad hives after taking penicillin.

Change Penicillin Drug-Drug interaction from '**Mild**' to '**Severe**'.

Make sure the reaction also includes **Hives**

Verify and/or Enter and save this information into the EHR. Verify that the changes have been saved.

Task 15 (a.8) Display the active medication allergy list

Display the current medications and allergies and determine if any allergies have been recorded.

The **Penicillin V potassium** 125 mg/ 5 mL oral solution prescribed triggered a Drug Allergy warning by the system. The nurse practitioner wants to know if the client is allergic to any other medications

Display the **historical medication allergy list** and review medication allergies previously reported.

Task 16 (a.8) Add an allergy

The client is reporting some itching after taking some Citalopram.

Add **Citalopram** as a **mild** allergy with the symptom of **Itch**.

Verify and/or Enter and save this information into the EHR. Verify that the changes have been saved.

Task 17 (a.9) Clinical Decision support-- Problem list

In the previous tasks **(F33.2) Major depressive disorder**, recurrent severe without psychotic features was added to the client's problem list. The clinical support tool displays an additional summary.

Please locate and open the ***Clinical Support tool*** that is appropriate for this diagnosis.

Mark as '**Accepted**' and
'Push to the Portal'

Verify and/or Enter and save this information into the EHR. Verify that the changes have been saved.

Task 18 (a.9) Clinical Decision support-- Medication list

In the previous tasks **Suboxone 12 mg-3 mg sublingual film** was added to the client's medication list. The system clinical support tool displayed an additional Clinical Decision Support summary.

Please locate and open the Clinical Support tool that is appropriate for this medication.

Task 19(a.9) Clinical Decision Support - Combination

Because your client is **Age 40 – 65** and **has a Diagnosis of (F33.2) Major depressive disorder**, recurrent severe without psychotic features, the system clinical support tool displayed a relevant CDS summary.

Please locate and open the Clinical Support tool that is appropriate for this situation.

Task 20 (a.9) Clinical Decision Support –View Information

Access and verbally state the following attributes for any one of the triggered CDS interventions:

Bibliographic citation, Developer, Funding source, Release/revision date.

Task 21 (a.14) Implantable Device List

The client has a Viva Quad Implantable heart device and has provided the following **Device UDI**:

(01)00643169007222(17)160128(21)BLC200461H

Please record this implantable device in their Implantable Devices list.

Verify and/or Enter and save this information into the EHR.

Verbally state the device description, identifiers, and other attributes of this device.

Task 22 (a.14) Implantable Device List - Change

The client reports the implantable device was removed.

Please change the device status to an **Inactive** status.

Verify and/or Enter and save this information into the EHR. Verify that the changes have been saved

Task 23 (b.2) Clinical Information Reconciliation and Incorporation

For the purposes of testing, we have already included a Health Exchange Document in your client's attachments. We need you to review the details and then specifically reconcile Allergy, Medications, and Problems.

Allergy

Add the **Penicillin G benzathine** Allergy to the Final Reconciled Allergy List.
Save the reconciled list to the client's profile.

Medication

Add **Ceftriaxone 100 mg/ ml** to the Final Reconciled Medications.
Save the reconciled list to the client's profile.

Problems

Add **Overweight** to the Final Reconciled Problem List.
Save the reconciled list to the client's profile.

Navigate to the Client's Allergies, Medications and Diagnoses sections and verify that the list(s) includes the newly reconciled items.

Task 24 (b.2) CCD A View reconciled data

The client continued on to the social worker after seeing the psychiatrist. After finishing with the social worker, the client goes to the checkout desk. While making the next appointment, the client asks to have a fully up-to-date Med list as a result of today's visit. You now need to **Generate a CCD Health Exchange** Document for your client. Please review the client's Profile for accuracy and generate the Health Exchange Document from there.

For the purposes of this testing, please set the **Output Options** to "**Print Health Exchange Document to Screen**" and view the content that could be sent to external agency.

Task 25 (b.3) e-Prescribing- New Prescription

You need to create an electronic prescription for your client. Create new prescription for

Prozac 40 mg

with a SIG: **Take 1 capsule by oral route one time per day.**

Include a **quantity of 30 pills** and **0 refills**.

Search and select a pharmacy to which the medication is to be sent, Finalize and review the prescription.

Send it to the pharmacy.

Verify and/or Enter and save this information into the EHR. Verify that the changes have been saved

Task 26 (b.3) e-Prescribing - Change prescription

Upon further thought and review of the prescription above, you have decided that a 20mg capsule is better for this client. You will need to make a change to the electronic prescription that you have just ordered.

Discontinue the Prozac 40 mg and re-enter a prescription for

Prozac 20 mg

with a SIG: **Take 1 capsule by oral route one time per day.**

Include a **quantity of 30 pills** and **0 refills**.

Verify and/or Enter and save this information into the EHR. Verify that the changes have been saved

Task 27 (b.3)eRX - Refill prescription

Your client has requested that their pharmacy refill some of their medications. The pharmacy has already sent an electronic refill request.

Access their prescriptions and authorize and refill the

Klor-Con M10 mEq tablet, extended release prescription for an additional **2 refills**

Verify and/or Enter and save this information into the EHR. Verify that the changes have been saved

Task 28 (b.3)eRX – View prescription information

Using the eRX feature look to see if there are any Rx Fill Notifications.

Verbally identify any Rx Fill Notifications (These are displayed as a note from the pharmacy).

You also want to take a look at historical medications

Filter the medications using the **Discontinued** status to see the history of prescribed medications.

Verbally identify historical medications that are displayed.

Task 29 (b.3) eRx Cancel prescription

Discontinue the **Prozac 20 mg** prescription.

Appendix D: System Usability Scale Questionnaire

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

Appendix E: Computer System Usability Questionnaire

Please provide your impression of the usability of the system by answering each of the questions below:

1. Overall, I am satisfied with how easy it is to use this system

Strongly 1 2 3 4 5 6 7 NA Strongly
Disagree Agree

2. It was simple to use this system

Strongly 1 2 3 4 5 6 7 NA Strongly
Disagree Agree

3. I can effectively complete my work using this system

Strongly 1 2 3 4 5 6 7 NA Strongly
Disagree Agree

4. I am able to complete my work quickly using this system

Strongly 1 2 3 4 5 6 7 NA Strongly
Disagree Agree

5. I am able to efficiently complete my work using this system

Strongly 1 2 3 4 5 6 7 NA Strongly
Disagree Agree

6. I feel comfortable using this system

Strongly 1 2 3 4 5 6 7 NA Strongly
Disagree Agree

7. It was easy to learn to use this system

Strongly 1 2 3 4 5 6 7 NA Strongly
Disagree Agree

8. I believe I became productive quickly using this system

Strongly 1 2 3 4 5 6 7 NA Strongly
Disagree Agree

9. The system gives error messages that clearly tell me how to fix problems

Strongly 1 2 3 4 5 6 7 NA Strongly
Disagree Agree

10. Whenever I make a mistake using the system, I recover easily and quickly

Strongly 1 2 3 4 5 6 7 NA Strongly
Disagree Agree

11. The information (such as online help, on-screen messages, and other documentation) provided with this system is clear

Strongly 1 2 3 4 5 6 7 NA Strongly
Disagree Agree

12. It is easy to find the information I needed

Strongly Disagree 1 2 3 4 5 6 7 NA Strongly Agree

13. The information provided for the system is easy to understand

Strongly Disagree 1 2 3 4 5 6 7 NA Strongly Agree

14. The information is effective in helping me complete the tasks and scenarios

Strongly Disagree 1 2 3 4 5 6 7 NA Strongly Agree

15. The organization of information on the system screens is clear

Strongly Disagree 1 2 3 4 5 6 7 NA Strongly Agree

16. The interface of this system is pleasant

Strongly Disagree 1 2 3 4 5 6 7 NA Strongly Agree

17. I like using the interface of this system

Strongly Disagree 1 2 3 4 5 6 7 NA Strongly Agree

18. This system has all the functions and capabilities I expect it to have

Strongly Disagree 1 2 3 4 5 6 7 NA Strongly Agree

19. Overall, I am satisfied with this system

Strongly Disagree 1 2 3 4 5 6 7 NA Strongly Agree

Appendix F. References

NISTIR 7741 - NIST Guide to the Processes Approach for Improving the Usability of Electronic Health Records, Robert M. Schumacher, User Centric, Inc., Svetlana Z. Lowry, Information Access division, Information Technology Laboratory, National Institute of Standards and Technology, U.S. Department of Commerce, National Institute of Standards and Technology, Version 0.2, 15-Nov.2010.

NISTIR 7742 - NIST Customized Common Industry Format Template for Electronic Health Record Usability Testing, Robert M. Schumacher, User Centric, Inc., Svetlana Z. Lowry, Information Access division, Information Technology Laboratory, National Institute of Standards and Technology, U.S. Department of Commerce, National Institute of Standards and Technology, Version 0.2, 15-Nov.2010.

NISTIR 7804 - Technical Evaluation, Testing, and Validation of the Usability of Electronic Health Records, Svetlana Z. Lowry, Matthew T. Quinn, Mala Ramaiah, Robert M. Schumacher, Emily s. Patterson, Robert North, , Information Access division, Information Technology Laboratory, National Institute of Standards and Technology, U.S. Department of Commerce, National Institute of Standards and Technology, Version 0.2, 15-Feb.2012.

ONC - 2015 Edition Certification Companion Guide Safety- enhanced design - 45 CFR 170.315(g)(3) 3/30/2016

ONC - 2015 Edition Certification - Test Procedure for §170.315(g)(3) Safety Enhanced Design

CSUQ - Lewis, J. R. (1995). IBM Computer Usability Satisfaction Questionnaires: Psychometric Evaluation and Instructions for Use. *International Journal of Human-Computer Interaction*, 7, 57-78.

SUS Brooke, J. (1996) SUS: a "quick and dirty" usability scale. In P. W. Jordan, B. Thomas, B. A. Weerdmeester & A. L. McClelland (eds.) *Usability Evaluation in Industry*. London: Taylor and Francis.