EHR Usability Test Report of:

Practice EHR Version 12

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

Date of Usability Test: 8/22/2017

Date of Report: 08/24/2017

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EXECUTIVE SUMMARY

A usability test of Practice EHR Version 12, Complete EHR was conducted on 08/22/2017 in Melville, NY by Practice EHR. The purpose of this test was to test and validate the usability of the current user interface, and provide evidence of usability in the EHR under test (EHRUT).

During the usability test, 10 healthcare providers (physicians and nurse practitioners) served as participants and used the EHRUT in simulated, but representative tasks.

This study collected performance data on 12 tasks typically conducted on an EHR:

- CPOE – Meds (315.a.1)
- CPOE – Labs (315.a.2)
- CPOE –Imaging (315.a.3)
- Drug-drug, drug-allergy interaction checks (315.a.4)
- Demographics (315.a.5)
- Problem List (315.a.6)
- Medication list (315.a.7)
- Medication allergy list (315.a.8)
- Clinical decision support (315.a.9)
- Implantable Device List (315.a.14)
- Clinical Information Reconciliation and Incorporation (315.b.2)
- Electronic prescribing (315.b.3)

During the 90 minutes one-on-one usability test, each participant was greeted by the administrator and asked to review and sign an informed consent; they were instructed that they could withdraw at any time. Most of the participants had prior experience with the software. The administrator introduced the test, and instructed participants to complete a series of tasks (given one at a time) using the EHRUT. During the testing, administrator timed the test and, recorded user performance data. The administrator did not give the participant assistance in how to complete the task.

The following types of data were collected for each participant:

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

All participant data was de-identified – no correspondence could be made from the identity of the participant to the data collected. Following the conclusion of the testing, participants were asked to complete a post-test questionnaire. None of the participants were compensated for their participation. 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.

Task	Number of Users	Task Success	Path Deviation	Task Time		Errors	Task Rating
	#	Mean (SD)	Deviations Observed/ Optimal	Mean (SD)	Deviations Observed/Optimal	Mean (SD)	Mean (SD)
CPOE – Meds	10	10 (100%)	1.13	76.2 (8.02)	0.96	0 (0%)	4.5 (0.52)
CPOE – Labs	10	10 (100%)	0	32.1 (6.15)	1.03	0 (0%)	4.5 (0.52)
CPOE – Imaging	10	10 (100%)	1.14	31.8 (6.21)	1.02	0 (0%)	4.4 (0.51)
Drug-drug, drug-allergy interaction checks	10	10 (100%)	0	80 (6.09)	0.97	0 (0%)	4.6 (0.48)
Demographics	10	10 (100%)	0	72.1 (6.13)	0.98	0 (0%)	4.6 (0.48)
Problem List	10	10 (100%)	0	45.5 (5.38)	0.96	0 (0%)	4.6 (0.48)
Medication list	10	10 (100%)	0	44.4 (4.22)	0.83	0 (0%)	4.6 (0.48)
Medication allergy list	10	10 (100%)	0	26.6 (5.05)	0.98	0 (0%)	4.6 (0.48)

Clinical decision support	10	8 (96%)	1.01	338.3 (36.97)	0.95	2 (4%)	4.3 (0.94)
Implantable Device List	10	10 (100%)	1.2	30.1 (6.13)	0.86	0 (0%)	4.8 (0.42)
Clinical Information Reconciliation and Incorporation	10	10 (100%)	1.14	41.8 (5.32)	0.99	0 (0%)	4.5 (0.52)
Electronic prescribing	10	9 (98%)	1.07	141.7 (8.26)	1.01	1 (2%)	4.6 (0.69)

The results from the System Usability Scale scored the subjective satisfaction with the system based on performance with these tasks to be 90.8%.

MAJOR FINDINGS
No major findings were reported.

AREAS FOR IMPROVEMENT
Only a couple of participants recommended the use of greater font size by default for clarity but besides that no other recommendations were received.

INTRODUCTION

The EHRUT tested for this study was Practice EHR, Version 12; Complete EHR which is designed to record and present medical information to healthcare providers in Ambulatory setting. 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:

- Task success
- Task errors
- Task time
- Path deviation
- Task ratings

METHOD

PARTICIPANTS

A total of 10 participants were tested on the EHRUT. Participants in the test were physicians and nurse practitioners. Participants were selected by Practice EHR and since each participant volunteered for test event participation, none of the participants were provided compensation for their time. In addition, participants had no direct connection to the development of or organization producing the EHRUT. Participants were not from the testing or supplier organization. Participants were given the opportunity to have the same orientation and level of training as the actual end users would have received. The following is a table of participants by characteristics, including demographics, professional experience, computing experience and user needs for assistive technology. Participant names were replaced with Participant IDs so that an individual's data cannot be tied back to individual identities.

	Part ID	Gender	Age	Education	Occupation	Professional Experience (Years)	Computer Experience (Years)	Product Experience (Years)	Assistive Technology Needs
1	p01	Male	42	MD	Doctor	10	17	2	No
2	p02	Male	50	MD	Doctor	20	16	3	No
3	p03	Female	54	MD	Doctor	20	13	4	No
4	p04	Female	40	Graduate	Nurse	10	12	2	No
5	p05	Male	47	Graduate	Nurse	15	13	1	No
6	p06	Female	38	MD	Doctor	6	12	2	No
7	p07	Female	43	MD	Doctor	14	15	4	No
8	p08	Male	39	MD	Doctor	9	11	3	No
9	p09	Male	41	MD	Doctor	11	13	4	No
10	p10	Female	40	Graduate	Nurse	10	5	2	No

10 participants were recruited and all participants were able to show up and conduct test. Participants were scheduled for 90 minutes session with 10 minutes in between each session for debrief by the administrator and data logger, and to reset systems to proper test conditions. A spreadsheet was used to keep track of the participant schedule, and included each participant's demographic characteristics.

STUDY DESIGN

Overall, the objective of this test was to uncover areas where the application performed well – that is, effectively, efficiently, and with satisfaction – and areas where the application failed to meet the needs of the participants. The data from this test may serve as a baseline for future tests with an updated version of the same EHR.

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

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

TASKS

A number of tasks were constructed that would be realistic and representative of the kinds of activities a user might do with this EHR, including:

• CPOE – Meds (315.a.1)

• CPOE – Labs (315.a.2)

• CPOE –Imaging (315.a.3)

• Drug-drug, drug-allergy interaction checks (315.a.4)

• Demographics (315.a.5)

• Problem List (315.a.6)

• Medication list (315.a.7)

• Medication allergy list (315.a.8)

• Clinical decision support (315.a.9)

• Implantable Device List (315.a.14)

• Clinical Information Reconciliation and Incorporation (315.b.2)

• Electronic prescribing (315.b.3)

The test scenarios for each participant were centered on common specified tasks. We provided the participants with descriptions of each task. However, we did not provide specific, step-by-step instructions on how to accomplish the designated task.

PROCEDURES

Upon arrival, participants were greeted; their identity was verified and matched with a name on the participant schedule. Participants were then assigned a participant ID. Each participant reviewed and signed an informed consent. A representative from the test team witnessed the participant's signature.

To ensure that the test ran smoothly, two staff members participated in this test, the usability administrator and the data logger.

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

Participants were instructed to perform the tasks (see specific instructions below):

- As quickly as possible making as few errors and deviations as possible.

- Without assistance; administrators were allowed to give immaterial guidance and clarification on tasks, but not instructions on use.
- Without using a think aloud technique.

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

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

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

TEST LOCATION

The test facility included a waiting area and a quiet testing room with a table, computer for the participant, and recording computer for the administrator. Only the participant and administrator were in the test room. All observers and the data logger worked from a separate room where they could see the participant's screen and face shot, and listen to the audio of the session. To ensure that the environment was comfortable for users, noise levels were kept to a minimum with the ambient temperature within a normal range. All of the safety instruction and evacuation procedures were valid, in place, and visible to the participants

TEST ENVIRONMENT

The EHRUT would be typically be used in a healthcare office or facility. In this instance, the testing was conducted in corporate office of Practice EHR in Melville, NY. For testing, the computer used was a Dell Desktop running Windows 10. The participants used a mouse and a keyboard when interacting with the EHRUT.

Practice EHR used 22 inch screen size display, screen resolution of 1920 X 1080. The application was set up by Practice EHR according to the vendor's documentation describing the system set-up and preparation. The application itself was running on a dedicated server using Windows Server 2012 using a test database on a LAN connection. Technically, the system performance (i.e., response time) was representative to what actual users would experience in a field implementation. Additionally, participants were instructed not to change any of the default system settings.

TEST FORMS AND TOOLS

During the usability test, various documents and instruments were used

- Informed Consent

- Non-Disclosure Agreement

- Instruction for Participants

- Post-Test Questionnaire

- System Usability Scale Questionnaire

PARTICIPANT INSTRUCTIONS

The administrator reads the following instructions aloud to the each participant:

Thank you for participating in this study. Your input is very important. Our session today will last about 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. You should complete the tasks as quickly as possible making as few errors as possible. Please try to complete the tasks on your own following the instructions very closely. Please note that we are not testing you, we are testing the system, therefore if you have difficulty all this means is 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.

Following the procedural instructions, participants were shown the EHR and as their first task, were given time 10 minutes to explore the system and make comments. Once this task was complete, the administrator gave the following instructions:

For each task, I will read the description to you and say "Begin." At that point, please perform the task and say "Done" once you believe you have successfully completed the task. I$_1$ would like to request that you not *talk aloud or verbalize while you are doing the tasks.   I will ask you your impressions about the task once you are done.*

Participants were then given 12 tasks to complete.

USABILITY METRICS

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

1. Effectiveness of Practice EHR by measuring participant success rates and errors

2. Efficiency of Practice EHR by measuring the average task time and path deviations

3. Satisfaction with Practice EHR by measuring ease of use ratings

DATA SCORING

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

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

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

Table: Details of how observed data were scored.

RESULTS

DATA ANALYSIS AND REPORTING

The results of the usability test were calculated according to the methods specified in the Usability Metrics section above. None of the participants or participant data was excluded from test data analysis and reporting.

The usability testing results for the EHRUT are detailed below in table. The data should yield actionable results that, if corrected, yield material, positive impact on user performance.

Task = <u>CPOE - Meds (315.a.1)</u>

Part ID	Success	Errors	Task Time Observed (Optimal) sec	Path Observed (Optimal) # of Steps	Task Rating (5=Easy)
p01	3	0	72 (79)	8 (8)	5
p02	3	0	85 (79)	8 (8)	4
p03	3	0	60 (79)	8 (8)	5
p04	3	0	76 (79)	8 (8)	5
p05	3	0	87 (79)	9 (8)	4
p06	3	0	80 (79)	8 (8)	4
p07	3	0	75 (79)	8 (8)	5
p08	3	0	79 (79)	8 (8)	4
p09	3	0	68 (79)	8 (8)	5
P10	3	0	80 (79)	8 (8)	4
Max Allowed Time= 5 min (300 sec)					
Task = CPOE					
1	Record medication via CPOE				
2	Change medication via CPOE				
3	Display changed CPOE medication order				
Total number of tasks=3					

Task = CPOE - Labs (315.a.2)

Part ID	Success	Errors	Task Time Observed (Optimal) (sec)	Path Observed (Optimal) # of Steps	Task Rating (5=Easy)
p01	3	0	28 (31)	7 (7)	5
p02	3	0	30 (31)	7 (7)	4
p03	3	0	29 (31)	7 (7)	5
p04	3	0	34 (31)	7 (7)	5
p05	3	0	32 (31)	7 (7)	5
p06	3	0	25 (31)	7 (7)	4
p07	3	0	45 (31)	7 (7)	4
p08	3	0	31 (31)	7 (7)	4
p09	3	0	27 (31)	7 (7)	5
P10	3	0	40 (31)	7 (7)	4
Max Allowed Time= 5 min (300 sec)					
Task = CPOE					
1	Record Lab order via CPOE				
2	Change Lab order via CPOE				
3	Display changed CPOE Lab order				
Total number of tasks= 3					

Task = <u>CPOE - Imaging (315.a.3)</u>

Part ID	Success	Errors	Task Time Observed (Optimal) (sec)	Path Observed (Optimal) # of Steps	Task Rating (5=Easy)
p01	3	0	28 (31)	7 (7)	5
p02	3	0	45 (31)	8 (7)	4
p03	3	0	29 (31)	7 (7)	5
p04	3	0	34 (31)	7 (7)	5
p05	3	0	30 (31)	7 (7)	4
p06	3	0	25 (31)	7 (7)	4
p07	3	0	30 (31)	7 (7)	4
p08	3	0	30 (31)	7 (7)	4
p09	3	0	27 (31)	7 (7)	5
P10	3	0	40 (31)	7 (7)	4
Max Allowed Time= 5 min (300 sec)					
Task = CPOE					
1	Record Imaging order via CPOE				
2	Change Imaging order via CPOE				
3	Display changed CPOE Imaging order				
Total number of tasks= 3					

PracticeEHR
Workflow Simplified

Task = <u>Drug-drug, drug-allergy interaction checks (315.a.4)</u>

Part ID	Success	Errors	Task Time Observed (Optimal) (sec)	Path Observed (Optimal) # of Steps	Task Rating (5=Easy)
p01	3	0	75 (82)	12 (12)	5
p02	3	0	81 (82)	12 (12)	4
p03	3	0	80 (82)	12 (12)	5
p04	3	0	78 (82)	12 (12)	5
p05	3	0	77 (82)	12 (12)	4
p06	3	0	76 (82)	12 (12)	5
p07	3	0	95 (82)	12 (12)	4
p08	3	0	78 (82)	12 (12)	5
p09	3	0	85 (82)	12 (12)	5
P10	3	0	75 (82)	12 (12)	5
Max Allowed Time= 5 min (300 sec)					
Task = Drug-drug, drug-allergy interaction checks					
1	Using CPOE, trigger a drug-drug interaction by entering a new medication order				
2	Using CPOE, trigger a drug-allergy interaction by entering a new medication order				
3	Adjust the severity level of a displayed drug-drug interaction				
Total number of tasks = 3					

Task = <u>Demographics (315.a.5)</u>

Part ID	Success	Errors	Task Time Observed (Optimal) (sec)	Path Observed (Optimal) # of Steps	Task Rating (5=Easy)
p01	3	0	67 (73)	6 (6)	5
p02	3	0	69 (73)	6 (6)	5
p03	3	0	85 (73)	6 (6)	4
p04	3	0	65 (73)	6 (6)	5
p05	3	0	75 (73)	6 (6)	5
p06	3	0	78 (73)	6 (6)	4
p07	3	0	67 (73)	6 (6)	5
p08	3	0	70 (73)	6 (6)	5
p09	3	0	75 (73)	6 (6)	4
P10	3	0	70 (73)	6 (6)	5
Max Allowed Time= 5 min (300 sec)					
Task = Demographics					
1	Record patient's demographics				
2	Change patient's demographics				
3	Display patient's demographic changes				
Total number of tasks = 3					

Task = Problem List (315.a.6)

Part ID	Success	Errors	Task Time Observed (Optimal) (sec)	Path Observed (Optimal) # of Steps	Task Rating (5=Easy)
p01	4	0	40 (47)	7 (7)	5
p02	4	0	43 (47)	7 (7)	5
p03	4	0	45 (47)	7 (7)	5
p04	4	0	41 (47)	7 (7)	5
p05	4	0	53 (47)	7 (7)	4
p06	4	0	43 (47)	7 (7)	5
p07	4	0	40 (47)	7 (7)	5
p08	4	0	50 (47)	7 (7)	4
p09	4	0	45 (47)	7 (7)	5
P10	4	0	55 (47)	7 (7)	4
Max Allowed Time= 5 min (300 sec)					
Task = Problem List					
1	Record a problem to the problem list				
2	Change a problem on the problem list				
3	Display the active problem list				
4	Display the historical problem list				
Total number of tasks = 4					

Task=Medication List (315.a.7)

Part ID	Success	Errors	Task Time Observed (Optimal) (sec)	Path Observed (Optimal) # of Steps	Task Rating (5=Easy)
p01	4	0	40 (53)	9 (9)	5
p02	4	0	43 (53)	9 (9)	4
p03	4	0	45 (53)	9 (9)	5
p04	4	0	41 (53)	9 (9)	5
p05	4	0	53 (53)	9 (9)	5
p06	4	0	43 (53)	9 (9)	4
p07	4	0	40 (53)	9 (9)	5
p08	4	0	50 (53)	9 (9)	5
p09	4	0	45 (53)	9 (9)	5
P10	4	0	44 (53)	9 (9)	4
Max Allowed Time= 5 min (300 sec)					
Task= Medication List					
1	Record Medication List				
2	Change Medication List				
3	Access Medication List				
4	Display the historical medication list				
Total number of tasks = 4					

Task= Medication Allergy List (315.a.8)

Part ID	Success	Errors	Task Time Observed (Optimal) (sec)	Path Observed (Optimal) # of Steps	Task Rating (5=Easy)
p01	4	0	25 (27)	6 (6)	5
p02	4	0	24 (27)	6 (6)	5
p03	4	0	30 (27)	6 (6)	4
p04	4	0	22 (27)	6 (6)	5
p05	4	0	35 (27)	6 (6)	4
p06	4	0	21 (27)	6 (6)	5
p07	4	0	23 (27)	6 (6)	5
p08	4	0	26 (27)	6 (6)	5
p09	4	0	35 (27)	6 (6)	4
P10	4	0	25 (27)	6 (6)	5
Max Allowed Time= 5 min (300 sec)					
Task = Medication Allergy List					
1	Record Medication Allergy List				
2	Change Medication Allergy List				
3	Access Medication Allergy List				
4	Show Medication Allergy History				
Total number of tasks = 4					

Task= Clinical decision support (315.a.9)

Part ID	Success	Errors	Task Time Observed (Optimal) (sec)	Path Observed (Optimal) # of Steps	Task Rating (5=Easy)
p01	5	0	330 (356)	69 (69)	5
p02	5	0	340 (356)	69 (69)	5
p03	5	0	350 (356)	69 (69)	4
p04	5	0	354 (356)	69 (69)	5
p05	4	1	375 (356)	70 (69)	3
p06	5	0	251 (356)	69 (69)	5
p07	5	0	320 (356)	69 (69)	5
p08	4	1	373 (356)	70 (69)	3
p09	5	0	320 (356)	69 (69)	5
P10	5	0	370 (356)	70 (69)	3
Max Allowed Time= 10 min (600 sec)					
Task = Clinical Decision Support					
1	Add CDS for all elements				
2	Trigger the CDS interventions/resources				
3	View the intervention/resource information using the Info-button standard				
4	Trigger the CDS interventions/resources based on data elements in the problem list, medication list, and medication allergy list by incorporating patient information from a transition of care/referral summary				
5	Access the attributes for triggered CDS				
Total number of tasks = 5					

Task= Implantable Device List (315.a.14)

Part ID	Success	Errors	Task Time Observed (Optimal) (sec)	Path Observed (Optimal) # of Steps	Task Rating (5=Easy)
p01	3	0	25 (35)	5 (5)	5
p02	3	0	24 (35)	5 (5)	5
p03	3	0	36 (35)	5 (5)	4
p04	3	0	22 (35)	5 (5)	5
p05	3	0	40(35)	6 (5)	4
p06	3	0	25 (35)	5 (5)	5
p07	3	0	30 (35)	5 (5)	5
p08	3	0	37 (35)	5 (5)	5
p09	3	0	32 (35)	5 (5)	5
P10	3	0	30 (35)	5 (5)	5
Max Allowed Time= 5 min (300 sec)					
Task = Medication Allergy List					
1	Record UDI				
2	Change UDI status				
3	Access Implantable Device List				
Total number of tasks = 3					

Task= Clinical information reconciliation (315.b.2)

Part ID	Success	Errors	Task Time Observed (Optimal) (sec)	Path Observed (Optimal) # of Steps	Task Rating (5=Easy)
p01	2	0	40 (42)	7 (7)	5
p02	2	0	38 (42)	7 (7)	5
p03	2	0	45 (42)	7 (7)	4
p04	2	0	36 (42)	7 (7)	5
p05	2	0	38 (42)	7 (7)	5
p06	2	0	40 (42)	7 (7)	5
p07	2	0	55 (42)	8 (7)	4
p08	2	0	41 (42)	7 (7)	4
p09	2	0	43 (42)	7 (7))	4
P10	2	0	42 (42)	7 (7)	4
Max Allowed Time= 5 min (300 sec)					
Task = Clinical Information Reconciliation					
1	Incorporate a CCDA and conduct reconciliation of the medications, medication allergies, and problems in the CCDA with the information currently in the patient's record				
2	Generate a new CCDA with reconciled data				
Total number of tasks = 2					

Task= Electronic prescribing(315.b.3)

Part ID	Success	Errors	Task Time Observed (Optimal) (sec)	Path Observed (Optimal) # of Steps	Task Rating (5=Easy)
p01	5	0	135 (140)	15 (15)	5
p02	5	0	138 (140)	15 (15)	5
p03	5	0	130 (140)	15 (15)	5
p04	5	0	145 (140)	15 (15)	4
p05	4	1	155 (140)	16 (15)	3
p06	5	0	145 (140)	15 (15)	5
p07	5	0	139 (140)	15 (15)	5
p08	5	0	155 (140)	15 (15)	4
p09	5	0	137 (140)	15 (15)	5
P10	5	0	138 (140)	15 (15)	5
Max Allowed Time= 5 min (300 sec)					
Task = Electronic Prescribing					
1	Create new prescriptions				
2	Change prescription (dosage or duration)				
3	Cancel Prescription				
4	Received fill status notification				
5	Request/Receive Med History				
Total number of tasks = 5					

DATA ANALYSIS REPORT:

Task	Number of Users	Task Success	Path Deviation	Task Time		Errors	Task Rating
	#	Mean (SD)	Deviations Observed/ Optimal	Mean (SD)	Deviations Observed/Optimal	Mean (SD)	Mean (SD)
CPOE – Meds	10	10 (100%)	1.13	76.2 (8.02)	0.96	0 (0%)	4.5 (0.52)
CPOE – Labs	10	10 (100%)	0	32.1 (6.15)	1.03	0 (0%)	4.5 (0.52)
CPOE – Imaging	10	10 (100%)	1.14	31.8 (6.21)	1.02	0 (0%)	4.4 (0.51)
Drug-drug, drug-allergy interaction checks	10	10 (100%)	0	80 (6.09)	0.97	0 (0%)	4.6 (0.48)
Demographics	10	10 (100%)	0	72.1 (6.13)	0.98	0 (0%)	4.6 (0.48)
Problem List	10	10 (100%)	0	45.5 (5.38)	0.96	0 (0%)	4.6 (0.48)
Medication list	10	10 (100%)	0	44.4 (4.22)	0.83	0 (0%)	4.6 (0.48)
Medication allergy list	10	10 (100%)	0	26.6 (5.05)	0.98	0 (0%)	4.6 (0.48)
Clinical decision support	10	8 (96%)	1.01	338.3 (36.97)	0.95	2 (4%)	4.3 (0.94)
Implantable Device List	10	10 (100%)	1.2	30.1 (6.13)	0.86	0 (0%)	4.8 (0.42)
Clinical Information Reconciliation and Incorporation	10	10 (100%)	1.14	41.8 (5.32)	0.99	0 (0%)	4.5 (0.52)
Electronic prescribing	10	9 (98%)	1.07	141.7 (8.26)	1.01	1 (2%)	4.6 (0.69)

The results from the SUS (System Usability Scale) scored the subjective satisfaction with the system based on performance with these tasks to be: 90.8. Broadly interpreted, scores under 60 represent systems with poor usability; scores over 80 would be considered above average.

DISCUSSION OF THE FINDINGS

We confirm that effectiveness and efficiency were evaluated.

EFFECTIVENESS

Task success rate and error rates were utilized to determine the effectiveness for usability report. Based on these two values and also as listed in the table above, the effectiveness proved to be in the positive range.

EFFICIENCY

Task time was utilized to determine the efficiency for usability report. Based on this value the report proved to be in the positive range and no major test findings were reported.

SATISFACTION

Task ratings were taken at the end of each session and were used to calculate satisfaction. Also, System Usability Scale (SUS) was utilized at the end of all sessions to get an overall satisfaction report. Based on both these criteria the report proved to be in the positive range.

MAJOR FINDINGS

No major findings were reported.

AREAS FOR IMPROVEMENT

Only a couple of participants recommended the use of greater font size by default for clarity but besides that no other recommendations were received.

Appendix 1: System Usability Scale Questionnaire

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

	Strongly Disagree				Strongly Agree

1. I think that I would like to use this system frequently

1	2	3	4	5

2. I found the system unnecessarily complex

1	2	3	4	5

3. I thought the system was easy to use

1	2	3	4	5

4. I think that I would need the support of a technical person to be able to use this system

1	2	3	4	5

5. I found various functions in system were well integrated

1	2	3	4	5

6. I thought there was too much inconsistency in this system

1	2	3	4	5

7. I would imagine that most people would learn to use this system very quickly

1	2	3	4	5

8. I found the system very cumbersome to use

1	2	3	4	5

9. I felt very confident using the system

1	2	3	4	5

10. I needed to learn a lot of things before I could get going with this system

1	2	3	4	5

Appendix 2: Recruiting Form

Name: _____

Organization:_____

Phone Number (xxx-xxx-xxxx) :_____

Email:_____

What is your Current Position?

- o Nurse Practitioner
- o Medical Assistant
- o Physician
- o Administrative Staff
- o Other:_____

How long have you held this position? (Years) _____

Which of the following describes your highest level of education?

- o High School Graduate
- o College Graduate
- o Post Grad (MD/PhD etc.)

What sort of activities do you perform on a computer? (Select all that apply)

- ☐ Email
- ☐ Access EHR
- ☐ Research
- ☐ Word Processing
- ☐ Reading News

□ Social Networking
□ Shopping/Banking
□ Other:_____

About how many hours per week do you work on a computer? (Hours)

o 0-5
o 5-10
o 11-25
o 26-35
o 36+

Which computer platform do you usually use?

o Mac
o Linux
o Windows
o Others:_____

How many EHRs do you use or are you familiar with?

_____

Appendix 3: Participant Demographics

Following is a high-level overview of participants in this study.

<u>Gender</u>

Men	5
Women	5
Total (Participants)	10

<u>Occupation/Role</u>

Doctor	7
Nurse	3
Total (Participants)	10

<u>Years of Experience</u>

Years of experience with EHR (average)	2.7