EHR Usability Test (EHRUT)

Patient Chart Manager 7.0

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

Product: Patient Chart Manager
Version: 7.0

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EXECUTIVE SUMMARY

A usability test of Patient Chart Manager, version 7.0, Ambulatory EHR, was conducted November 20 – December 20, 2018 by Prime Clinical Systems. 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, twelve health IT users matching the target demographic criteria served as participants and used the EHRUT in simulated, but representative tasks.

This study collected performance data on 23 tasks in the following twelve areas, typically conducted on an EHR:

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

During the various one-on-one usability tests, each participant was greeted by the administrator and asked to review and sign an Informed Consent and a Non-Disclosure Agreement (see Appendix 5 and Appendix 6, respectively); they were instructed that they could withdraw at any time. All participants were current users of Patient Chart Manager, so they had prior experience with at least some of the above areas. A Patient Chart Manager trainer provided a training session to each participant prior to each usability study. The administrator introduced the test, and instructed participants to complete a series of tasks (given one at a time) using the EHRUT. During the testing, the administrator timed the test and, along with the data logger, recorded user performance data on paper and electronically. The administrator did not give the participant assistance in how to complete the task except in areas of task instructions when the directions seemed unclear.

Participant screens and audio were recorded for subsequent analysis.

The following types of data were collected 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
- 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 and satisfaction survey. Participants were then sent a $100 gift card as compensation for their time. Various recommended metrics, in accordance with the examples set forth in the *NIST Guide to the Processes Approach for Improving the Usability of Electronic Health Records*, were used to evaluate the usability of the EHRUT.

Following is a summary of the performance and rating data collected on the EHRUT:

Task	Total Participants	Total # of Successful Attempts	Task Success % (Avg)	Task Time Average (seconds)	Task Time Standard Deviation	Errors Due to Failure to Complete	Errors Due to Failure to Complete Task w/i Time	Task Errors % (Avg)	Task Path Deviations - Observed/Optimal	Ratio of Path Deviation	Task Ratings Average (5=Easy)	Task Ratings Standard Deviation
1. Add Demographics	10	8	80	109.38	38.24	2	0	20	136/128	1.06	4.9	0.32
2. Modify Demographics (triggers CDS alert)	10	9	90	93.67	52.61	1	0	10	117/99	1.18	4.6	0.70
3. Review Modified Demographics	10	10	100	27	8.84	0	0	0	40/40	1.00	4.9	0.32
4. Add Vital Signs (triggers CDS alert)	10	10	100	82.4	25.7	0	0	0	147/140	1.05	4.5	0.71
5. Add Current Medications	12	10	83.33	49	21.16	2	0	16.67	97/90	1.08	4.5	1.00
6. Modify Medications	10	9	90	35.78	20.74	1	0	10	49/45	1.09	4.9	0.32
7. Add Medication Allergy	10	10	100	54	24.92	0	0	0	101/80	1.26	4.5	0.71
8. Modify Medication Allergy	10	10	100	20.1	17.01	0	0	0	14/10	1.40	4.9	0.32
9. Add to the Problem List	10	4	40	74.25	32.83	4	2	60	62/40	1.55	3	1.41
10 .Modify the Problem List	10	6	60	24.33	8.48	1	3	40	24/12	2.00	3.9	1.37
11. Create Radiology Order	11	8	72.73	72	24.91	3	0	27.27	97/88	1.10	4.45	0.82
12. Modify Radiology Order	10	9	90	28.33	11.74	1	0	10	57/54	1.06	5	0.00

Task Description	Total Participants	Total # of Successful Attempts	Task Success % (Avg)	Task Time Average (seconds)	Task Time Standard Deviation	Errors Due to Failure to Complete	Errors Due to Failure to Complete Task w/i Time	Task Errors % (Avg)	Task Path Deviations - Observed/Optimal	Ratio of Path Deviation	Task Ratings Average (5=Easy)	Task Ratings Standard Deviation
13. Create Lab Order	10	10	100	72.4	23.27	0	0	0	176/160	1.10	4.4	1.07
14. Modify Lab Order	12	11	91.67	33.64	13.88	1	0	8.33	60/55	1.09	4.92	0.29
15. Create Medication Order (triggers Drug-Drug intervention)	10	8	80	138.63	55.81	2	0	20	185/160	1.16	3.6	1.17
16. Adjust Severity Level of Drug-Drug/Drug-Allergy Interaction Warnings	10	8	80	49.5	27.25	2	0	20	69/64	1.08	3.6	1.50
17. File and Reconcile CDA	10	5	50	66.6	26.31	4	1	50	94/80	1.18	4	0.82
18. Add Implantable Device	12	6	50	102.83	63.76	6	0	50	76/60	1.27	3.42	1.44
19. Modify Implantable Device	10	9	90	36	10.92	1	0	10	28/27	1.04	4.4	1.26
20. Create a New E-Prescription	10	9	90	69.55	34.89	1	0	10	117/99	1.18	4.9	0.32
21. Approve an Electronic Refill Request	10	8	80	52.12	20.66	2	0	20	60/48	1.25	3.7	1.49
22. Process an Electronic Change Request	10	8	80	36	13.55	2	0	20	27/24	1.13	3.9	1.20
23. Cancel E-Prescription	10	8	80	37.37	15.76	1	1	20	54/48	1.13	4.7	0.95

The results from the System Usability Scale scored the subjective satisfaction with the system based on performance with these tasks to be: 71.9[1].

In addition to the performance data, the following qualitative observations were made:

Major Findings

Overall, the majority of tasks had an 80-100% success rate, indicating that most participants could successfully complete what was asked of them. Almost 70% of the tasks had an average rating of 4-5 out of 5 points, indicating a general satisfaction amongst most participants regarding most tasks. The Satisfaction Survey revealed that most participants find the EHR to be user friendly.

Problem List: This feature stood out as a high risk area due to the high failure rate, lowest satisfaction ratings, path deviations per successful participant, and verbal comments.

- Participants were unable to properly interact with the Syndrome Surveillance feature and couldn't cancel out of the feature once they initiated it. A number of participants verbally noted that they didn't have a way to get out of the feature.
- Some of the participants chose to use the suboptimal path to adding problems to the Problem List. Per the participants, the suboptimal path is often chosen because it allows for more robust searching. It does not, however, allow for Syndrome Surveillance diagnoses to be added to the Problem List. This results in the participants being required to add problems from two different locations when Syndrome Surveillance diagnoses are involved.
- In certain scenarios when editing the Problem List, participants encounter a Row ID error that requires refreshing the pane and trying the action again. Although all participants were trained on refreshing the Problem List pane prior to testing, most participants struggled with addressing the Row ID error.

Clinical Decision Support: Study observations suggested that a number of participants didn't understand how to properly interact with the Risk Initialization pop up that's related to the Clinical Decision Support feature. They didn't understand when it was appropriate to click OK versus Cancel.

CPOE Medication & Drug-Drug, Drug-Allergy Interaction Warnings: Numerous deviations were caused by the participants being uncertain of how to clear the drug name after the Drug-Drug interaction alert so that they could search for an alternative medication.

[1] See Tullis, T. & Albert, W. (2008). Measuring the User Experience. Burlington, MA: Morgan Kaufman (p. 149). Broadly interpreted, scores under 60 represent systems with poor usability; scores over 80 would be considered above average.

Clinical Information Reconciliation & Incorporation: This feature is another high risk area due to it being a relatively new feature. Most participants were not familiar with its functionality which led to an average 50% success rate. They struggled with locating where to complete the task and how to properly complete the task.

Implantable Device List: This feature is also a high risk area due to being a completely new feature. All participants were unfamiliar with the functionality prior to training for the test. This led to an average 50% success rate for adding a new device.

- The UDI details can only be downloaded after entering the device ID in a specific format, as the downloaded information is reliant on a third party. Furthermore, the manual entry of the device ID made it a tedious process for the participants.
- The study observation showed that the process of entering the device ID, clicking away from the field, and then right-clicking back on the field to display the option to download the data was not an intuitive process.

Areas for Improvement

Prime Clinical Systems should consider the following improvements:

Problem List:

- Proactive training and documentation on the Syndrome Surveillance feature so that the end users hopefully acquire a better understanding of how the feature and prompts work.
- An option to cancel out of the Syndrome Surveillance prompts once the feature is initially selected.
- The ability to add all diagnoses from the suboptimal diagnosis search path, regardless of the diagnosis triggering Syndrome Surveillance reporting.
- More robust search options from the optimal diagnosis search path.
- A method to streamline refreshing the Problem List pane when the Row ID error is encountered. For example, clicking OK in the message would automatically refresh the pane.

Clinical Decision Support:

- Providing more of an explanation within the Risk Initialization pop up so that the users better understand how to interact with the prompt.

CPOE Medication & Drug-Drug, Drug-Allergy Interaction Warnings:

- A method to streamline the process of clearing the drug name and searching for an alternative medication. For example, in the interaction alert, selecting 'Choose Another Drug' would automatically clear the existing drug name and open the drug search screen.

Clinical Information Reconciliation & Incorporation:

- Proactive training and documentation on how this functionality works.

Implantable Device List:

- Proactive training and documentation to ensure the end user knows they must manually enter the device ID and in a very specific format.
- A method to make entering the device ID and then selecting to download the device details more intuitive.

INTRODUCTION

The EHRUT tested for this study was Patient Chart Manager, version 7.0. Designed to present medical information to healthcare providers in ambulatory healthcare settings, the EHRUT allows healthcare IT users to electronically store and access data, make clinical decisions, document findings, electronically prescribe medicine, create lab and radiology orders, provide patient education, etc. 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 time to perform each task, success rate, path deviations, number and type of errors, and ease of use, were captured during the usability testing.

METHOD

Participants

A total of twelve participants were tested on the EHRUT. Participants in the test were various healthcare personnel. Participants were recruited by Prime Clinical Systems and were compensated $100 gift cards 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 a typical end user would have received.

For the test purposes, participants were recruited by Prime Clinical Systems staff. The recruitment was based on an internal knowledge of the end-users' willingness to learn and adapt to new EHR functionalities as well as their ability to provide constructive feedback on improving the EHR.

Recruited participants had a mix of backgrounds and demographic characteristics. 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/Role	Professional Experience	Computer Experience	PCM Product Experience	Assistive Technology Needs
101	Female	30-39	Some College	Practice Administrator	13 years	20 years	6 years	None
102	Female	50-59	College	RN, Office Manager	37 years	26 years	12 years	None
103	Female	40-49	Some College	Office Manager, Medical Assistant	14 years	14 years	2 years	None
104	Female	40-49	High School	Billing, Registration	10 years	20 years	2 years	None
105	Female	60-69	College	Office Manager	30 years	29 years	8 years	None
106	Female	30-39	Some College	Front Office, Back Office, Referrals	13 years	20 years	4 years	None
107	Female	40-49	Some College	Medical Assistant	20 years	15 years	7 years	None
108	Female	40-49	College	Practice Manager	9 years	20 years	9 years	None
109	Female	30-39	College	Medical Biller	3 years	15 years	3 years	None
110	Female	30-39	Some College	Medical Assistant, Physician Scribe	4 years	10 years	4 years	None
111	Female	50-59	College	Practice Manager	11 years	30 years	11 years	None
112	Female	60-69	College	RN, Practice Manager	30 years	10 years	10 years	None
NO ID	Male	40-49	College	Medical Doctor	20 years	25 years	10 years	None

Thirteen participants (matching the demographics in the section on Participants) were recruited and twelve participated in the usability study. One participant failed to show for the study.

Participants were scheduled for either 30 or 60 minute test sessions, depending on what areas of functionality they were testing. A spreadsheet was used to keep track of the participant schedule.

Study Design

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

During the usability test, participants interacted with one EHR. Each participant used the system in the same setup of a remote server accessed using an online meeting session, and was provided with the same instructions for their testing area. 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
- 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:

- Add Demographics
- Modify Demographics (triggers CDS alert)
- Review Modified Demographics
- Add Vital Signs (triggers CDS alert)
- Add Current Medication
- Modify Medication
- Add Medication Allergy
- Modify Medication Allergy
- Add to the Problem List
- Modify the Problem List
- Create Radiology Order
- Modify Radiology Order
- Create Lab Order
- Modify Lab Order
- Create Medication Order (triggers Drug-Drug, Drug-Allergy Intervention)
- Adjust Severity Level of Drug-Drug, Drug-Allergy Interaction Warnings
- File and Reconcile CDA
- Add Implantable Device
- Modify Implantable Device
- Create a New E-Prescription

- Approve an Electronic Refill Request
- Process and Electronic Change Request
- Cancel E-Prescription

Tasks were selected based on their frequency of use, criticality of function, and those that may be most troublesome for users. Tasks should always be constructed in light of the study objectives.

Procedure

Upon connection to the online meeting session, 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 and Non-Disclosure Agreement (see Appendix 5 and Appendix 6, respectively). A representative from the test team witnessed the participant's signature.

To ensure that the test ran smoothly, two Prime Clinical Systems 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 errors and deviations. A second person served as the data logger and took notes on task success, path deviations and errors, and task times.

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.

For each task, the participants were given a written copy of the task. Task timing began once the administrator finished reading the task description and stated "Start". The task time was stopped once the participant indicated they had successfully completed the task. Scoring is discussed below in the Data Scoring section.

Following the session, the administrator gave the participant the Satisfaction Survey and System Usability Scale Questionnaire (see Appendix 7 and Appendix 8, respectively) 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.

Participants were thanked for their time and compensated with a $100 gift card via UPS Ground. A tracking number was provided to each participant to ensure they received their compensation.

Test Location

All participants were tested over an online meeting session.

Prior to the test session, the participant was asked to select a quiet location with minimal distractions, as well as a computer that could connect to the online meeting session. The administrator, data logger, and participant were the only ones on the call.

Test Environment

The EHRUT would typically be used in a healthcare office or facility. In this instance, the testing was conducted over an online meeting session. The participants used a keyboard and mouse when interacting with the EHRUT.

The Patient Chart Manager application was running in a test environment on Windows Server 2012 R2 Standard with 1440 x 900 screen resolution. Technically, the system performance (i.e. response time) was representative to what actual users would experience in a field implementation.

Test Forms and Tools

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

- Participant Questionnaire
- Informed Consent
- Non-Disclosure Agreement
- Moderator's Guide
- Task Instructions
- Satisfaction Survey
- System Usability Scale Questionnaire

Examples of these documents can be found in the Appendices. The Moderator's Guide was devised so as to be able to capture required data.

The participant's audio and interaction with the EHRUT was captured and recorded digitally with audio and screen capture software running on the online meeting session.

Participant Instructions

The administrator reads the following instructions aloud to each participant (also see the full Moderator's Guide in Appendix 3):

> *Thank you for taking the time to participate in this study. Our session today will last about 60 minutes. During that time, you will be performing a number of tasks in the Patient Chart Manager software.*
>
> *You will be asked to complete these tasks on your own, trying to do them as quickly as possible with the fewest possible errors or deviations. Don't do anything more than what is asked. And please note that we are not testing you, we are testing the system. We are interested in how easy or difficult this system is to use, what in it would be useful to you, and how we could improve it.*
>
> *I will be here in case you need specific help, but I may not be able to instruct you or provide help in how to use the software.*
>
> *We realize you are helping us; and should you feel it necessary, you are able to withdraw at any time during the testing for any reason.*
>
> *We are recording both the screen and audio of our session today. All of the information that you provide will be kept confidential and your name will not be associated with your comments at any time. At this time, I'd like to have you read and sign simple permission forms.*
>
> ***Have participant read/sign Informed Consent and Non-Disclosure Agreement***
>
> *Getting started, the process will be as follows for each task:*
> *I will read the description of the task and ask you to begin.*
> *Please start the task only when I say 'Start'.*
> *And then say 'Done' when you believe you are finished with the task.*
> *There will be a few tasks towards the end where I'll log into the software as different users for you to complete the tasks.*

I'll ask you a couple of questions for feedback and then we'll move on to the next task.
At the end of testing, there will be a couple of quick surveys for you to complete.

Before we begin testing – have you printed your Test Scenarios? Please note that the test scenarios contain the details you'll need to know in order to complete the task, for example, what allergy to add to the chart or what demographic to edit, etc.

Participants were then given their set of tasks to complete. Tasks are listed in the Moderator's Guide and Task Instructions (See Appendix 3 and Appendix 4, respectively).

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:

- Effectiveness of Patient Chart Manager by measuring participant success rates and errors
- Efficiency of Patient Chart Manager by measuring the average task time and path deviations
- Satisfaction with Patient Chart Manager 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 were recorded in a spreadsheet and operationally defined by 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 __ seconds then allotted task time performance was __ 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 "Start" 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 Patient Chart Manager overall, the testing team administered the System Usability Scale (SUS) post-test questionnaire. Questions included, "I think I would like to use this system frequently," "I thought the system was easy to use," and "I would imagine that most people would learn to use this system very quickly." See full System Usability Scale questionnaire in the Appendix.

RESULTS

Data Analysis and Reporting

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

The usability testing results for the EHRUT are detailed below. The results should be seen in light of the objectives and goals outlined in the Study Design section.

Task	Total Participants	Total # of Successful Attempts	Task Success % (Avg)	Task Time Average (seconds)	Task Time Standard Deviation	Errors Due to Failure to Complete	Errors Due to Failure to Complete Task w/i Time	Task Errors % (Avg)	Task Path Deviations - Observed/Optimal	Ratio of Path Deviation	Task Ratings Average (5=Easy)	Task Ratings Standard Deviation
1. Add Demographics	10	8	80	109.38	38.24	2	0	20	136/128	1.06	4.9	0.32
2. Modify Demographics (triggers CDS alert)	10	9	90	93.67	52.61	1	0	10	117/99	1.18	4.6	0.70
3. Review Modified Demographics	10	10	100	27	8.84	0	0	0	40/40	1.00	4.9	0.32
4. Add Vital Signs (triggers CDS alert)	10	10	100	82.4	25.7	0	0	0	147/140	1.05	4.5	0.71
5. Add Current Medications	12	10	83.33	49	21.16	2	0	16.67	97/90	1.08	4.5	1.00
6. Modify Medications	10	9	90	35.78	20.74	1	0	10	49/45	1.09	4.9	0.32
7. Add Medication Allergy	10	10	100	54	24.92	0	0	0	101/80	1.26	4.5	0.71
8. Modify Medication Allergy	10	10	100	20.1	17.01	0	0	0	14/10	1.40	4.9	0.32
9. Add to the Problem List	10	4	40	74.25	32.83	4	2	60	62/40	1.55	3	1.41

Task Description	Total Participants	Total # of Successful Attempts	Task Success % (Avg)	Task Time Average (seconds)	Task Time Standard Deviation	Errors Due to Failure to Complete	Errors Due to Failure to Complete Task w/i Time	Task Errors % (Avg)	Task Path Deviations - Observed/Optimal	Ratio of Path Deviation	Task Ratings Average (5=Easy)	Task Ratings Standard Deviation
10 .Modify the Problem List	10	6	60	24.33	8.48	1	3	40	24/12	2.00	3.9	1.37
11. Create Radiology Order	11	8	72.73	72	24.91	3	0	27.27	97/88	1.10	4.45	0.82
12. Modify Radiology Order	10	9	90	28.33	11.74	1	0	10	57/54	1.06	5	0.00
13. Create Lab Order	10	10	100	72.4	23.27	0	0	0	176/160	1.10	4.4	1.07
14. Modify Lab Order	12	11	91.67	33.64	13.88	1	0	8.33	60/55	1.09	4.92	0.29
15. Create Medication Order (triggers Drug-Drug intervention)	10	8	80	138.63	55.81	2	0	20	185/160	1.16	3.6	1.17
16. Adjust Severity Level of Drug-Drug/Drug-Allergy Interaction Warnings	10	8	80	49.5	27.25	2	0	20	69/64	1.08	3.6	1.50
17. File and Reconcile CDA	10	5	50	66.6	26.31	4	1	50	94/80	1.18	4	0.82
18. Add Implantable Device	12	6	50	102.83	63.76	6	0	50	76/60	1.27	3.42	1.44
19. Modify Implantable Device	10	9	90	36	10.92	1	0	10	28/27	1.04	4.4	1.26
20. Create a New E-Prescription	10	9	90	69.55	34.89	1	0	10	117/99	1.18	4.9	0.32
21. Approve an Electronic Refill Request	10	8	80	52.12	20.66	2	0	20	60/48	1.25	3.7	1.49

Task Description	Total Participants	Total # of Successful Attempts	Task Success % (Avg)	Task Time Average (seconds)	Task Time Standard Deviation	Errors Due to Failure to Complete	Errors Due to Failure to Complete Task w/i Time	Task Errors % (Avg)	Task Path Deviations - Observed/Optimal	Ratio of Path Deviation	Task Ratings Average (5=Easy)	Task Ratings Standard Deviation
22. Process an Electronic Change Request	10	8	80	36	13.55	2	0	20	27/24	1.13	3.9	1.20
23. Cancel E-Prescription	10	8	80	37.37	15.76	1	1	20	54/48	1.13	4.7	0.95

The results from the SUS (System Usability Scale) scored the subjective satisfaction with the system based on performance with these tasks to be: 71.9. Broadly interpreted, scores under 60 represent systems with poor usability; scores over 80 would be considered above average.

DISCUSSION OF THE FINDINGS

170.315(a)(5) Demographics

Effectiveness: The average success rate for the three tasks associated with (a)(5) Demographics was between 80-100%. The task failures were due to the participants not being careful with their selections (i.e. choosing the wrong marital status, etc), as opposed to being unable to complete the task altogether. The path deviations were mostly due to the participants being either unfamiliar with entering and editing demographics in Patient Chart Manager or being unfamiliar with the Preventive Services Risk Initialization pop up. The unfamiliarity led to participants adding extra steps while searching for what to select or where to enter data.

Efficiency: Two of the three tasks (adding and modifying) had a wide range of task times. Path deviations for the same two tasks, however, were mostly minimal. This was likely due to participants being unfamiliar with the demographic screen in Patient Chart Manager and requiring more time to locate the fields that required entry and editing.

Satisfaction: The participants rated the three tasks rather well for ease of use. The average ratings for the three tasks ranged between 4.6 to 4.9 out of 5 points.

170.315(a)(9) Clinical Decision Support

Effectiveness: The average success rates for the two tasks related to (a)(9) Clinical Decision Support were 90% and 100%. Only one participant failed one of the tasks, and it was due to making an incorrect selection (i.e. incorrect marital status), not due to truly being unable to complete the task. For both tasks, 50% of participants completed the tasks within the optimal step count. The participants with path deviations were mostly only one or two steps beyond the optimal step count.

Efficiency: Both tasks had a wide range of task times. Path deviations were rather minimal, however. The study observations suggested that there were a number of participants unfamiliar with the Preventive Services functionality, which led to them taking additional time to complete the tasks.

Satisfaction: The average rating for each task was 4.6 and 4.5 out of 5 points. The participants mainly rated both tasks as either Very Easy or Somewhat Easy, with a couple rating as Neither Easy Nor Difficult.

170.315(a)(7) Medication List

Effectiveness: The average success rates for the two tasks associated with (a)(7) Medication List were 83% and 90%. The two participants who failed adding a current medication did so because they were unfamiliar with the medication list and selected to write a prescription instead of update the current list.

The participant who failed modifying the medication list was able to modify the medication successfully; however they selected the wrong reason for the update. The path deviations were minimal, with participants either hitting the optimal step count or being only one or two steps beyond the optimal step count.

Efficiency: The majority of task times were relatively similar. There was, however, a task time for each task that was noticeably higher than the other times. Path deviations were mostly minimal for both tasks.

Satisfaction: The majority of participants rated both tasks with 5 out of 5 points. The two participants who rated one task particularly low, with 2 and 3 out of 5 points, were both unfamiliar with adding medications to the patient chart. Overall, the average ratings for each task were 4.5 and 4.9 out of 5 points.

170.315(a)(8) Medication Allergy List

Effectiveness: Both tasks associated with (a)(8) Medication Allergy List had success rates of 100%. A few participants completed the task for adding an allergy with the optimal step count. Most participants for that task, however, were at least one or two steps beyond the optimal step count. The study observations suggested this was due to the participants having to scroll to find fields they were otherwise unfamiliar with. Path deviations for the task to modify the allergy list were quite minimal. The majority of participants completed it with the optimal step count. A few participants were one or two steps beyond the optimal step count.

Efficiency: The task for adding an allergy had a wide range of task times and most often included path deviations. Both of these factors suggest that a number of participants spent additional time and added steps in order to figure out how to properly complete the data entry. The task times and path deviations for the task to modify the allergy list were less sporadic.

Satisfaction: The participants rated the task to add an allergy with an average score of 4.5 out of 5 points. Participant comments regarding dissatisfaction revolved around the need to scroll in order to enter some data points. The task to modify the allergy list had almost all 5 out of 5 point ratings, with only one participant rating the task at 4 points.

170.315(a)(6) Problem List

Effectiveness: Both tasks related to (a)(6) Problem List had high failure rates. The task to add to the problem list had a 60% failure rate. One participant failed due to time as they were unable to effectively work through the Syndrome Surveillance functionality and still add the problems before time ran out. Another participant failed due to time because they opted to use the suboptimal path, which allows for easier searching but does not allow for the task to be completed without also partially using the optimal

path (requiring data entry from multiple places). The user eventually abandoned the task altogether. The other participants failed either due to selecting the wrong diagnosis or abandoning the task altogether due to frustration with the suboptimal path. One participant who completed the task did so without any deviations; however the other participants were five to nine steps beyond the optimal step count. And almost all deviations were due to the Syndrome Surveillance option and the participants not understanding which option to select, and then once they made the wrong selection, not having an option to cancel out. The task to modify the problem list had a 40% failure rate. Three of the participants failed due to time. They spent a large amount of time trying to resolve the Row ID error message they received. It requires refreshing the pane prior to attempting to change the status. The fourth participant failed due to abandoning the task after they couldn't figure out how to change the status. Two participants who completed the task did so without any deviations; however the other participants were one to five steps beyond the optimal step count, due to either addressing the Row ID error or scrolling and clicking to figure out where and how to update the status. All of these factors suggest that the Problem List should be more effective and user-friendly.

Efficiency: Of the participants who completed the task to add to the problem list, there was a relatively wide range of task times, as well as a number of path deviations. The study observations showed that the increased task times and deviations were almost entirely due to the Syndrome Surveillance functionality. Of the participants who completed the task to modify the problem list, those with higher task times and more deviations were attempting to address the Row ID error they received. All of these factors suggest that the efficiency of the Problem List can be improved.

Satisfaction: The participant ratings for the task to add to the problem list were mostly low, averaging 3 out of 5 points. Over half of the ratings were between 1-3 points, with the remaining ratings between 4-5 points. The ratings for the task to modify the problem list were higher, averaging 3.9. Most of the ratings were between 4-5 points, with only two ratings between 1-2 points.

170.315(a)(3) CPOE – Diagnostic Imaging

Effectiveness: The average success rates for the two tasks associated with (a)(3) CPOE Diagnostic Imaging were 73% and 90%. The participants who failed either task did so due to selecting the incorrect contrast option (i.e. not reading the instructions carefully enough), as opposed to not being able to complete the task. The path deviations were minimal for both tasks.

Efficiency: The task for creating a radiology order had a wide range of task times. Study observations suggested this was partially due to the task requiring manual typing – some participants typed faster than others. The task for modifying the radiology order had a smaller range of task times as it was a simpler task that did not require manual typing. Path deviations for both tasks were quite minimal.

Satisfaction: The participant ratings for the task to create a radiology order averaged 4.45 out of 5 points. Individual ratings were mostly 5 out of 5 points, with several ratings between 3-4 points. The participant ratings for the task to modify the radiology order were all 5 out of 5 points.

170.315(a)(2) CPOE – Laboratory

Effectiveness: Both tasks associated with (a)(2) CPOE Laboratory had high success rates at 100% and 92%. The one participant who failed the task to modify the lab order did so due to deleting one of the ordered lab tests, as opposed to not being able to complete the task altogether. Most participants had path deviations when creating the lab order. Almost all of these deviations were due to the participant using the suboptimal path for searching for and selecting the diagnosis and/or interacting wrong with the Diagnosis pane. On the other hand, almost all participants had no deviations when editing the lab order.

Efficiency: There was a wide range of task times when creating the lab order. Study observations showed this was mainly due to path deviations when using the suboptimal path for searching for and selecting the diagnosis. The task times for modifying the lab order were mostly similar in range. Path deviations were minimal as well.

Satisfaction: The participant ratings for creating a lab order averaged out to 4.4 out of 5 points. Most individual ratings were 5 points, with several between 2-4 points. The participant ratings for modifying the lab order averaged out to 4.92 out of 5 points.

170.315(a)(1) CPOE – Medications

Effectiveness: The task related to (a)(1) CPOE Medications had an average success rate of 80%. One participant who failed did so because they selected to fax the prescription instead of phone the prescription as the instructions noted. The other participant who failed ultimately abandoned the task as they couldn't figure out how to complete it. That particular participant had no prior experience with writing prescriptions in the EHR. Of the participants who were successful, half had no deviations. The other half of participants had anywhere from three to ten steps beyond the optimal step count. All deviations included issues with clearing the drug name that caused the Drug-Drug interaction alert so that they could search for an alternative drug. The effectiveness of this process could be greatly increased if the steps to delete the drug name and search for a new drug were more intuitive.

Efficiency: There was a wide range of task times. This was mainly due to path deviations when attempting to delete the drug name that caused the Drug-Drug interaction alert.

Satisfaction: The task received an average rating of 3.6 out of 5 points. Most of the individual ratings were 4 out of 5 points, with a couple as low as 1-2 points. The participant who rated the task with 1 point had no prior experience with writing prescriptions in the EHR.

170.315(a)(4) Drug-Drug, Drug-Allergy Interaction Checks

Effectiveness: There were two tasks related to (a)(4) Drug-Drug, Drug-Allergy Interaction Checks. One task involved the participant addressing a Drug-Drug interaction alert while prescribing. There was an 80% success rate with that task. Details regarding the success rate and path deviations can be found in the Effectiveness section for (a)(1) CPOE Medications. The other task involved the participant adjusting their user setting for the interaction alerts. There was an 80% success rate for this task as well. Both participants who failed did so because they could not figure out where to make the change to their user settings. Most of the participants who were successful had no path deviations. A couple of participants had 2-4 steps beyond the optimal step count as they were having issues with finding where to make the change.

Efficiency: There was a wide range of task times for both tasks. This was due to path deviations when attempting to delete the drug name that caused the Drug-Drug interaction alert, as well as path deviations when trying to find where to make the change to the user setting for interaction alerts. A number of participants commented that they felt the task for adjusting their user setting wasn't easy because they'd quickly forget where to make the change and would have to enlist help from Trainers or Support.

Satisfaction: Both tasks received an average rating of 3.6 out of 5 points. Most of the individual ratings for the task that addressed a Drug-Drug interaction alert while prescribing were 4 out of 5 points, with a couple as low as 1-2 points. The participant who rated the task with 1 point had no prior experience with writing prescriptions in the EHR. Half of the individual ratings for the task that involved adjusting the user setting for interaction alerts were between 4-5 points. The remaining ratings were between 1-3 points.

170.315(b)(2) Clinical Information Reconciliation and Incorporation

Effectiveness: The task associated with (b)(2) Clinical Information Reconciliation and Incorporation had an average success rate of 50%. One participant failed due to time. The other participants who failed did so because they either couldn't figure out how to properly complete the task or because they missed the final step of the task. Most participants who were successful had at least 4 steps over the optimal step count. For most participants, this was a completely new feature with which they had no prior experience. This factor largely played into the failure rate and path deviations.

Efficiency: There was a wide range of task times and most successful participants had path deviations. Study observations suggested this was largely due to this being a new feature with which most participants had no prior experience.

Satisfaction: The participants rated the task with an average of 4 out of 5 points. The majority of individual ratings were between 3-4 points.

170.315(a)(14) Implantable Device List

Effectiveness: There were two tasks associated with (a)(14) Implantable Device List. The task to add an implantable device had an average success rate of 50%. The participants who failed did so because they didn't properly access the chart for data entry and/or they couldn't figure out how to properly enter the data and download the details. Of the successful participants, over half had no deviations. The successful participants with deviations had between 2-14 steps beyond the optimal step count. For all participants, this was a completely new feature with which they had no prior experience. This factor largely played into the failure rate and path deviations. The study observations, however, displayed that the process to download the additional device details is not very intuitive. It requires clicking away from the field where the device ID is entered and then right-clicking back on the field to access the menu with the option to 'get' the device details. The task to modify the implantable device list had an average success rate of 90%. One participant failed the task as they couldn't figure out how to update the list. Almost all successful participants had no path deviations.

Efficiency: The task to add an implantable device had a relatively wide range of task times. The two highest task times also had the path deviations. The task to modify the implantable device list had a smaller range of task times and minimal path deviations.

Satisfaction: For the task to add an implantable device, the participants gave an average rating of 3.42 out of 5 points. The individual ratings ranged from 1-5 points, with the lowest ratings from those participants who could not intuitively figure out how to complete the task. For the task to modify the device list, the participants gave an average rating of 4.4 out of 5 points. Most individual ratings were 5 points. Two were 4 points and one was 1 point.

170.315(b)(3) E-Prescribing

Effectiveness: There were four tasks associated with (b)(3) E-Prescribing. The task to create a new e-Prescription had an average success rate of 90%. The participant who failed did so because they chose to fax the prescription instead of send via e-Prescribe. The path deviations were quite minimal. The one participant with a high number of deviations first added the medication by updating the list, then deleted and properly e-Prescribed. The other three tasks (refill request, change request and cancel) each had an average success rate of 80%. The participants who failed did so because they couldn't properly figure out how to complete the tasks. Of the successful participants, path deviations for all three tasks were rather minimal.

Efficiency: All four tasks had somewhat wide ranges of task times, though deviations for all four were mostly minimal. This suggests some participants took more time between each step.

Satisfaction: The task to create a new e-Prescription had an average rating of 4.9 out of 5 points. The task to approve an electronic refill request had an average rating of 3.7 out of 5 points. Most individual

ratings were between 4-5 points. Three ratings were between 1-2 points. The task to process an electronic change request had an average rating of 3.9 out of 5 points. The majority of individual ratings were between 4-5 points, with the remaining ratings between 2-3 points. The task to cancel and e-Prescription had an average rating of 4.7 out of 5 points. Almost all individual ratings were 5 points, with only one rating at 2 points.

Major Findings

Overall, the majority of tasks had an 80-100% success rate, indicating that most participants could successfully complete what was asked of them. Almost 70% of the tasks had an average rating of 4-5 out of 5 points, indicating a general satisfaction amongst most participants regarding most tasks. The Satisfaction Survey revealed that most participants find the EHR to be user friendly.

Problem List: This feature stood out as a high risk area due to the high failure rate, lowest satisfaction ratings, path deviations per successful participant, and verbal comments.

- Participants were unable to properly interact with the Syndrome Surveillance feature and couldn't cancel out of the feature once they initiated it. A number of participants verbally noted that they didn't have a way to get out of the feature.
- Some of the participants chose to use the suboptimal path to adding problems to the Problem List. Per the participants, the suboptimal path is often chosen because it allows for more robust searching. It does not, however, allow for Syndrome Surveillance diagnoses to be added to the Problem List. This results in the participants being required to add problems from two different locations when Syndrome Surveillance diagnoses are involved.
- In certain scenarios when editing the Problem List, participants encounter a Row ID error that requires refreshing the pane and trying the action again. Although all participants were trained on refreshing the Problem List pane prior to testing, most participants struggled with addressing the Row ID error.

Clinical Decision Support: Study observations suggested that a number of participants didn't understand how to properly interact with the Risk Initialization pop up that's related to the Clinical Decision Support feature. They didn't understand when it was appropriate to click OK versus Cancel.

CPOE Medication & Drug-Drug, Drug-Allergy Interaction Warnings: Numerous deviations were caused by the participants being uncertain of how to clear the drug name after the Drug-Drug interaction alert so that they could search for an alternative medication.

Clinical Information Reconciliation & Incorporation: This feature is another high risk area due to it being a relatively new feature. Most participants were not familiar with its functionality which led to an average 50% success rate. They struggled with locating where to complete the task and how to properly complete the task.

Implantable Device List: This feature is also a high risk area due to being a completely new feature. All participants were unfamiliar with the functionality prior to training for the test. This led to an average 50% success rate for adding a new device.

- The UDI details can only be downloaded after entering the device ID in a specific format, as the downloaded information is reliant on a third party. Furthermore, the manual entry of the device ID made it a tedious process for the participants.
- The study observation showed that the process of entering the device ID, clicking away from the field, and then right-clicking back on the field to display the option to download the data was not an intuitive process.

Areas for Improvement

Prime Clinical Systems should consider the following improvements:

Problem List:

- Proactive training and documentation on the Syndrome Surveillance feature so that the end users hopefully acquire a better understanding of how the feature and prompts work.
- An option to cancel out of the Syndrome Surveillance prompts once the feature is initially selected.
- The ability to add all diagnoses from the suboptimal diagnosis search path, regardless of the diagnosis triggering Syndrome Surveillance reporting.
- More robust search options from the optimal diagnosis search path.
- A method to streamline refreshing the Problem List pane when the Row ID error is encountered. For example, clicking OK in the message would automatically refresh the pane.

Clinical Decision Support:

- Providing more of an explanation within the Risk Initialization pop up so that the users better understand how to interact with the prompt.

CPOE Medication & Drug-Drug, Drug-Allergy Interaction Warnings:

- A method to streamline the process of clearing the drug name and searching for an alternative medication. For example, in the interaction alert, selecting 'Choose Another Drug' would automatically clear the existing drug name and open the drug search screen.

Clinical Information Reconciliation & Incorporation:

- Proactive training and documentation on how this functionality works.

Implantable Device List:

- Proactive training and documentation to ensure the end user knows they must manually enter the device ID and in a very specific format.
- A method to make entering the device ID and then selecting to download the device details more intuitive.

APPENDICES

Appendix 1: Participant Demographics

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

Participant Gender	Count
Male	0
Female	12

Participant Age	Count
30-39	4
40-49	4
50-59	2
60-69	2

Participant Education	Count
High School	1
Some College	5
College	6

Participant Occupation/Role	Count
Practice Manager	4
Registered Nurse	2
Medical Assistant	2
Billing	2
Front and Back Office	1
Physician Scribe	1

Participant Professional Experience	Years
Average	16

Participant Computer Experience	Years
Average	19

Participant Product Experience	Years
Average	6.5

Appendix 2: Participant Questionnaire

PARTICIPANT QUESTIONNAIRE

1. Name: _____

2. Direct Phone Number: _____

3. Email Address: _____

4. Gender: [ ] Male [ ] Female [ ] Other

5. Age: [ ] 19 or younger [ ] 50-59
[ ] 20-29 [ ] 60-69
[ ] 30-39 [ ] 70-79
[ ] 40-49 [ ] 80 or older

6. Education level: [ ] High School [ ] Some College [ ] College

7. Have you participated in a focus group or usability test in the past 6 months? [ ] Yes [ ] No

8. Do you, or does anyone in your home, have a commercial or research interest in an electronic health record software or consulting company? [ ] Yes [ ] No

9. Do you require any assistive technologies to use a computer? [ ] Yes [ ] No

If yes, please describe: _____

10. What is your occupation or role? _____

11. How many years of professional experience do you have in this role? _____

12. How many years of computer experience do you have? _____

13. How would you describe your computer experience? [ ] Novice [ ] Intermediate [ ] Expert

14. How many months or years have you worked with Patient Chart Manager? _____

Appendix 3: Moderator Guide

Patient Chart Manager Usability Test

Moderator Guide

Administrator: _____

Data Logger: _____

Date and Time:

Participant #:

Location: Remote webinar (Go To Meeting)

Orientation:

Thank you for taking the time to participate in this study. Our session today will last about XX minutes. During that time, you will be performing a number of tasks in the Patient Chart Manager software.

You will be asked to complete these tasks on your own, trying to do them as quickly as possible with the fewest possible errors or deviations. Don't do anything more than what is asked. And please note that we are not testing you, we are testing the system. We are interested in how easy or difficult this system is to use, what in it would be useful to you, and how we could improve it.

I will be here in case you need specific help, but I may not be able to instruct you or provide help in how to use the software.

We realize you are helping us; and should you feel it necessary, you are able to withdraw at any time during the testing for any reason.

We are recording both the screen and audio of our session today. All of the information that you provide will be kept confidential and your name will not be associated with your comments at any time. At this time, I'd like to have you read and sign simple permission forms.

Have participant read/sign Informed Consent and Non-Disclosure Agreement

Getting started, the process will be as follows for each task:
I will read the description of the task and ask you to begin.

Please start the task only when I say 'Start'.
And then say 'Done' when you believe you are finished with the task.
There will be a few tasks towards the end where I'll log into the software as different users for you to complete the tasks.
I'll ask you a couple of questions for feedback and then we'll move on to the next task.
At the end of testing, there will be a couple of quick surveys for you to complete.

Before we begin testing – have you printed your Test Scenarios? Please note that the test scenarios contain the details you'll need to know in order to complete the task, for example, what allergy to add to the chart or what demographic to edit, etc.

Task 1: Add Demographics (under AXU281)

1. Patient **PAM USABILITY** needs to have demographics added to her chart. Open her chart and add the following demographics and save:
    a. Date of Birth: **5/5/1979**
    b. Birth Sex: **Female**
    c. Marital: **Single**
    d. Race 1: **Asian**
    e. Ethnicity: **Not Hispanic or Latino**
    f. Language: **English**
    g. Sexual Orientation: **Heterosexual**
    h. Gender Identity: **Female**
2. The system then prompts to check for various Preventive Services risks. There are no known risks at this time.

PATH(S) TO COMPLETION:

Optimal Path:	**Optimal Path con't:**
1. Click in the Patient Search field	10. Select Language
2. Type the patient name and press Enter	11. Select Sexual Orientation
3. Select patient from search results (chart opens)	12. Select Gender Identity
4. Open Patient Data Editor	13. Click Save/Close
5. Enter DOB	14. Click Yes to save
6. Select sex	15. Leave boxes unchecked in Prev Svc Risk Init window and click OK
7. Select Marital status	16. Click Ok to confirm
8. Select Race	
9. Select Ethnicity	

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Task 2: Modify Demographics (includes CDS Intervention for Breast Cancer Screening)

1. Patient **PAM USABILITY** needs to have several demographics changed. Modify the below demographics in her chart and save:
    a. Date of Birth: **5/5/1977**
    b. Marital: **Married**
    c. Race 1: **White**
2. Upon closing the demographics window, the system alerts you that new Reminder Alerts have been added to the chart. Confirm the CDS Intervention alert for Breast Cancer Screening was added to the chart.
3. View the Breast Cancer Screening guideline information.
4. Close the guideline information and the patient reminder screen.

PATH(S) TO COMPLETION:	
Optimal Path: 1. Open the Patient Data Editor 2. Edit the DOB 3. Edit the Marital Status	**Optimal Path con't:** 7. Click OK to show Reminder Screen 8. Right-click on Breast Cancer Screening 9. Select Show Guideline

4. Edit the Race 5. Click Save/Close 6. Click Yes to save	10. Close or minimize Internet Explorer 11. Click Close to close Reminder Screen

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Task 3: Review Modified Demographics

1. Review patient **PAM USABILITY's** demographics to confirm the changes to the date of birth, marital status, and race.
2. Close the demographics screen.

PATH(S) TO COMPLETION:	
Optimal Path: 1. Open the Patient Data Editor 2. Confirm changes to the demographics 3. Click Save/Close 4. Click Yes to save	

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Task 4: Add Vital Signs (includes CDS Intervention for High BMI)

1. The staff has measured patient **PAM USABILITY**'s height, weight, etc. and provided you with the following values. Enter the following values into her chart:
    a. Height: **65 inches**
    b. Weight: **190 lbs**
    c. BP Syst: **110**
    d. BP Diast: **90**
    e. Temp: **98.6 F**
2. Exit from the Data Tables and/or Document and the system alerts you that new Reminder Alerts have been added to the chart. Confirm the CDS Intervention alert for Weight & Health Risks was added to the chart.
3. View the Weight & Health Risks guideline information.
4. Close the guideline information and the patient reminder screen.

PATH(S) TO COMPLETION:	
Optimal Path: 1. Open Patient Data Tables	**Optimal Path con't:** 8. Enter Temp

2. Select Vital Signs tab 3. Click Add New 4. Enter Height 5. Enter Weight 6. Enter BP Syst 7. Enter BP Diast	9. Click Close to close Patient Data Tables 10. Click OK to show Reminder Screen 11. Right-click on Weight & Health Risks 12. Select Show Guideline 13. Close or minimize Internet Explorer 14. Click Close to close Reminder Screen

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Task 5: Add Current Medications

1. Patient **PAM USABILITY** has informed you that she is currently taking another medication prescribed by another doctor. Add the following medication to her chart:
    a. **Lithium Carbonate 300 mg Capsule, 1 capsule T.I.D.**

PATH(S) TO COMPLETION:	
Optimal Path: 1. Click Add New on Meds pane 2. Select Update Medication List	**Optimal Path con't:** 6. Click Select and Close 7. Select Quantity from drop down

3. Type drug name 4. Hit Enter or click Search 5. Select drug	8. Select Frequency from drop down 9. Click Save

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Task 6: Modify Medications

1. Patient **PAM USABILITY** then remembers that her Lithium dosage was recently changed. Update her medication list by modifying the Lithium Sig as follows:
    a. **1 Capsule B.I.D.**

PATH(S) TO COMPLETION:	
Optimal Path: 1. Double-click on row (or rt-click > Change Dose) 2. Change Frequency from drop down 3. Click Save	4. Select CHANGE IN DOSAGE from reason drop down 5. Click OK

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Task 7: Add Medication Allergies

1. Patient **PAM USABILITY** mentions that she recently had a reaction to a certain type of antibiotic. Add the following medication allergy to her chart:
    a. Allergen: **Avelox**
    b. Reaction: **Swelling**
    c. Severity: **Moderate**

PATH(S) TO COMPLETION:	
Optimal Path: 1. Click Add New in the Allergies pane 2. Select Drug Allergy 3. Type allergen 4. Hit Enter or click Search	**Optimal Path con't:** 5. Select allergen 6. Click Select and Close 7. Select allergic reaction 8. Select severity

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Task 8: Modify Medication Allergies

1. Patient **PAM USABILITY** also mentions that Avelox gives her a rash. **Modify** her medication allergy list as follows:
    a. For allergen **AVELOX**, change the Reaction to **Rash**.

PATH(S) TO COMPLETION:	
Optimal Path (NOT via office note): 1. Change reaction drop down to Rash	

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Task 9: Add to the Problem List

1. Patient **PAM USABILITY**, explains that she was recently diagnosed with several issues. Add the following problems to her chart:
    a. **Generalized Anxiety Disorder**
    b. **Raynaud's syndrome without gangrene**
    c. **Hypoglycemia, Unspecified**

PATH(S) TO COMPLETION:	
Optimal Path:	**Optimal Path con't:**
1. Click in first blank ICD9/10/SN field of Dx pane	6. Click the drop down arrow
2. Click the drop down arrow	7. Select 2nd problem (I7300)
3. Select Generalized Anxiety (F411)	8. Click in next blank ICD9/10/SN field
4. Click No for 'just updating' regarding Synd Surv	9. Click the drop down arrow
5. Click in next blank ICD9/10/SN field	10. Select 3rd problem (E162)

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Task 10: Modify the Problem List

1. For patient **PAM USABILITY**, modify the problem list as follows:
    a. Change the status of **Raynaud's syndrome** to **Chronic**.
    b. Change the status of **Hypoglycemia** to **Intermittent**.

PATH(S) TO COMPLETION:	
Optimal Path: 1. Change the status of Raynaud's 2. Change the status of Hypoglycemia	

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Task 11: Create Radiology Order

1. During the examination of patient **PAM USABILITY**, you decide to create a radiology order. Using the document named **IMAGING ORDER** at the top of the list (with Doc Code of _USABILITY), create an order for the following:
    a. **Abdomen CT Scan, Without Contrast**
    b. Reason for study: **Right lower quadrant pain**
2. Close and save the requisition.

PATH(S) TO COMPLETION:	
Optimal Path: 1. Click Attach New Doc 2. Click OK for default date 3. Select IMAGING ORDER 4. Click OK 5. Type the reason for study 6. Click the picklist @/delete the @/click next to the @	**Optimal Path con't:** 7. Select CT Abdomen (ALT: type the order) 8. Check off Without Contrast 9. Click Exit/Close 10. Click Yes to save 11. Click Yes for finished

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Task 12: Modify Radiology Order

1. For patient **PAM USABILITY**, change the radiology order that was just created to the following:
    a. **Abdomen CT Scan, With Contrast**
    b. Reason for study: **Right lower quadrant pain**
2. Close and save the requisition.

PATH(S) TO COMPLETION:	
Optimal Path: 1. Open the requisition document from the previous task 2. Uncheck Without Contrast 3. Check Contrast	4. Click Exit/Close 5. Click Yes to save 6. Click Yes for finished

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Task 13: Create Lab Order

1. For patient **PAM USABILITY**, you decide to create a lab order. Using the document named **LAB ORDER** at the top of the list (with Doc Code of _USABILITY), create an order for the following:
    a. **Complete Blood Count**
    b. Reason/Diagnosis: **Iron Deficiency Anemia (D50.9)**
    c. Chief complaint: **Fatigue**
2. Close and save the requisition.

PATH(S) TO COMPLETION:	
Optimal Path:	**Optimal Path con't:**
1. Click Attach New Doc	9. Click the drop down arrow
2. Click OK for default date	10. Select D50.9
3. Select LAB ORDER	11. Check off D50.9
4. Click OK	12. Click OK or Cancel for Encounter Log entry
5. Click the picklist @/ delete @/ click next to the @	13. Click Close
6. Select Complete Blood Count (ALT: type CBC)	14. Click Exit/Close
7. Click blue Diagnosis link	15. Click Yes to save
8. Click in the next blank line	16. Click Yes for finished

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Task 14: Modify Lab Order

1. For patient **PAM USABILITY**, modify the lab order that was just created to **also** include a lab test for the following:
    a. **TSH, 3rd Generation**
2. Close and save the requisition.

PATH(S) TO COMPLETION:	
Optimal Path: 1. Open the requisition document from the previous task 2. Manually type TSH -or- Double-click on blue picklist text & (w/CBC still checked) select TSH	3. Click Exit/Close 4. Click Yes to save 5. Click Yes for finished

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Task 15: Create Medication Order, View Drug-Drug and Drug-Allergy Interventions

1. Patient **PAM USABILITY** complains of joint pain. You decide to prescribe **Naproxen 250mg, 1 tablet per day as needed for pain**. The patient requests that you call the prescription in to the pharmacy.
2. During prescribing, you notice the Drug-Drug Intervention alert between Naproxen and Lithium. You decide to instead prescribe **Acetaminophen 500mg tablet, once per day as needed for pain**.

PATH(S) TO COMPLETION:	
Optimal Path:	**Optimal Path con't:**
1. Click Rx in Meds pane	11. Click OK to delete
2. Type drug name in the search field	12. Type new drug name in search field
3. Hit Enter or click Search	13. Hit Enter or click Search
4. Select the drug from the list	14. Select drug from the list
5. Click Prescribe	15. Click Prescribe
6. Select Sig Other, prn pain	16. Select Sig Other, prn pain
7. Check Finished	17. Check Finished
8. Click OK to confirm refills/dispense	18. Click OK to confirm refills/dispense
9. Click Choose Different Drug	19. Click Phone RX to preview the prescription
10. Double-click on the drug name	20. Click Phone RX to save/close

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Task 16: Adjust Severity Level of Drug-Drug/Drug-Allergy Interaction Warnings

1. During the last task, a warning message (Drug-Drug Interaction alert) was displayed while prescribing. You decide that you'd like to reduce the amount of Drug-Drug and Drug-Allergy Warnings that display while prescribing. In PCM, set your Override Warning alert to only prompt on Red, not Yellow.
2. Close the Options window and the Program Setup window.

PATH(S) TO COMPLETION:	
Optimal Path:	
1. Click Miscellaneous Options	5. Check box for When Override Warning Exists…
2. Select Prog Setup	6. Click OK
3. Click Setup Misc User Defaults	7. Click OK
4. Click Prescription tab	8. Close Prog Setup Window

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Task 17: File and Reconcile CDA

1. Patient **PAM USABILITY** brought in summary information from another facility on a USB thumb drive. Your staff has copied the information from the drive to the inbox in PCM where inbound CDAs are waiting to be filed to charts.
2. Locate the CDA for patient **PAM USABILITY** and select it.
3. File the CDA to her chart and perform the reconciliation now.
4. Reconcile the medications, allergies, and problems by adding the data from the CDA to her chart in PCM.

PATH(S) TO COMPLETION:	
Optimal Path:	**Optimal Path con't:**
1. Click File From Inboxes	9. Click Med List Reconciled
2. Select WEB tab	10. Select allergy
3. Select file name PAM USABILITY	11. Click >
4. Select patient's name in search results	12. Click Allergy List Reconciled
5. Click File to Selected Patient	13. Select problem
6. Click OK to reconcile	14. Click >
7. Select medication	15. Click OK for interaction warning
8. Click >	16. Click Problem List Reconciled

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Task 18: Add Implantable Device

1. Patient **JIM USABILITY** has come into the office today and informed you that he has an implanted device. Add the following implantable device to the chart and "get" (retrieve) the associated device information:
    a. UDI: (01)00613994127631(21)613994127631

PATH(S) TO COMPLETION:	
Optimal Path: 1. Click in the Patient Search field 2. Type the patient name and press Enter 3. Select patient from search results (chart opens) 4. Open Patient Data Tables 5. Select Implanted Devices tab 6. Click Add New	**Optimal Path con't:** 7. Type the UDI 8. Click or Tab away from the UDI field 9. Right-click on the UDI field 10. Select Get Device Information and the device details autofill

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Task 19: Modify Implantable Device List

1. For patient **JIM USABILITY**, modify the Implantable Device List as follows:
    a. Mark the device previously added with a status of **Inactive**. Also note that the reason it was deactivated is because it was **Removed**.
2. Close the patient data tables.

PATH(S) TO COMPLETION:	
Optimal Path: 1. Change the Status drop down to Inactive 2. Type Removed in the REASON DEACTIVATED field 3. Close the data tables	

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Task 20: Create a New E-Prescription

1. For patient **JIM USABILITY**, you need to prescribe the following medication:
    a. Drug: **Doxycycline Hyclate 100mg capsule**
    b. Sig: **1 Capsule P.O. b.i.d.**
    c. Refills: **0**
    d. Dispense: **14**
2. Per his request, you submit the prescription electronically to his **default eRx pharmacy**.

PATH(S) TO COMPLETION:	
Optimal Path: 1. In Meds Pane, click RX 2. Type drug name in the search field 3. Hit Enter or click Search 4. Select the drug from the list 5. Click Prescribe 6. Select/enter b.i.d. for Sig	**Optimal Path con't:** 7. Change Dispense to 14 8. Check Finished box 9. Click OK to confirm refills and dispense amounts 10. Click e-Prescribe button to preview 11. Click e-Prescribe button to send

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Task 21: Approve an Electronic Refill Request (use IXS272)

1. Every day, you monitor your tasks for electronic prescription refill requests. Today, there is an electronic refill request for patient **ELIZABETH ITASCA**.
2. **Approve** the electronic refill request as is.
3. Return it to the sending pharmacy.

PATH(S) TO COMPLETION:	
Optimal Path: 1. Open Task Manager 2. Select task and check Completed box (ALT: open task, click Send Response) 3. With 'Approved' in the Response field, click Opening PCM Prescription Form	**Optimal Path con't:** 4. Check Finished 5. Click eRx button to preview 6. Click eRx button to send

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Task 22: Process an Electronic Change Request (use MXG271)

1. Every day, you monitor your tasks for electronic prescription change requests. Today, there is a change request for patient **GRANT CUSTER**.
2. **Approve** the electronic change request for 1 tablet three times per day after meals as needed for pain.

PATH(S) TO COMPLETION:	
Optimal Path: 1. Open Task Manager 2. Select task and check Completed box (ALT: open task, click Send Response)	3. With 'Approved' in the Response field, click Send Refill/Change Response

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Task 23: Cancel E-Prescription (use AXB267)

1. For patient **SUSANNE ADIRONDACK**, you need to cancel the previously submitted E-prescription for Hydrochlorothiazide 50 MG Tablet

PATH(S) TO COMPLETION:	
Optimal Path:	
1. Click in the Patient Search field	4. Right-click on Hydrochlorothiazide
2. Type the patient name and press Enter	5. Select CancelRX
3. Select patient from search results (chart opens)	6. Click OK in the message that displays

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Appendix 4: Task Instructions

USABILITY TEST TASKS

Task 1: Add Demographics

1. Patient **PAM USABILITY** needs to have demographics added to her chart. Open her chart, add the following demographics and save:
    a. Date of Birth: **5/5/1979**
    b. Birth Sex: **Female**
    c. Marital: **Single**
    d. Race 1: **Asian**
    e. Ethnicity: **Not Hispanic or Latino**
    f. Language: **English**
    g. Sexual Orientation: **Heterosexual**
    h. Gender Identity: **Female**
2. After closing the demographics screen, the system then prompts to check for various Preventive Services risks. There are no known risks at this time.

Task 2: Modify Demographics (includes CDS Intervention for Breast Cancer Screening)

1. Patient **PAM USABILITY** needs to have several demographics changed. Modify the below demographics in her chart and save:
    a. Date of Birth: **5/5/1977**
    b. Marital: **Married**
    c. Race 1: **White**
2. Upon closing the demographics window, the system alerts you that new Reminder Alerts have been added to the chart. Confirm the CDS Intervention alert for Breast Cancer Screening was added to the chart.
3. View the Breast Cancer Screening guideline information.
4. Close the guideline information and the patient reminder screen.

Task 3: Review Modified Demographics

1. Review patient **PAM USABILITY's** demographics to confirm the changes to the date of birth, marital status, and race.
2. Close the demographics screen.

Task 4: Add Vital Signs (includes CDS Intervention for High BMI)

1. The staff has measured patient **PAM USABILITY**'s height, weight, etc. and provided you with the following values. Enter the following values into her chart:
    a. Height: **65 inches**
    b. Weight: **190 lbs**
    c. BP Syst: **110**
    d. BP Diast: **90**
    e. Temp: **98.6**
2. Exit from the Data Tables and/or Document and the system alerts you that new Reminder Alerts have been added to the chart. Confirm the CDS Intervention alert for Weight & Health Risks was added to the chart.
3. View the Weight & Health Risks guideline information.
4. Close the guideline information and the patient reminder screen.

Task 5: Add Current Medications

1. Patient **PAM USABILITY** has informed you that she is currently taking another medication prescribed by another doctor. Add the following medication to her chart:
    a. Lithium Carbonate 300 mg Capsule, 1 capsule T.I.D.

Task 6: Modify Medications

1. Patient **PAM USABILITY** then remembers that her Lithium dosage was recently changed. Update her medication list by modifying the Lithium Sig as follows:
    a. 1 Capsule B.I.D.

Task 7: Add Medication Allergies

1. Patient **PAM USABILITY** mentions that she recently had a reaction to a certain type of antibiotic. Add the following medication allergy to her chart:
    a. Allergen: **Avelox**
    b. Reaction: **Swelling**
    c. Severity: **Moderate**

Task 8: Modify Medication Allergies

1. Patient **PAM USABILITY** also mentions that Avelox gives her a rash. **Modify** her medication allergy list as follows:
    a. For allergen **AVELOX**, change the Reaction to **Rash**.

Task 9: Add to the Problem List

1. Patient **PAM USABILITY**, explains that she was recently diagnosed with several issues. Add the following problems to her chart:
    a. Generalized Anxiety Disorder
    b. Raynaud's syndrome without gangrene
    c. Hypoglycemia, Unspecified

Task 10: Modify the Problem List

1. For patient **PAM USABILITY**, modify the problem list as follows:
    a. Change the status of **Raynaud's syndrome** to **Chronic**.
    b. Change the status of **Hypoglycemia** to **Intermittent**.

Task 11: Create Radiology Order

1. During the examination of patient **PAM USABILITY**, you decide to create a radiology order. Using the document named **IMAGING ORDER** at the top of the list (with Doc Code of _USABILITY), create an order for the following:
    a. **Abdomen CT Scan, Without Contrast**
    b. Reason for study: **Right lower quadrant pain**
2. Close and save the requisition.

Task 12: Modify Radiology Order

1. For patient **PAM USABILITY**, change the radiology order that was just created to the following:
    a. **Abdomen CT Scan, With Contrast**
    b. Reason for study: **Right lower quadrant pain**
2. Close and save the requisition.

Task 13: Create Lab Order

1. For patient **PAM USABILITY**, you decide to create a lab order. Using the document named **LAB ORDER** at the top of the list (with Doc Code of _USABILITY), create an order for the following:
    a. **Complete Blood Count**
    b. Reason/Diagnosis: **Iron Deficiency Anemia, Unspecified (D50.9)**
2. Close and save the requisition.

Task 14: Modify Lab Order

1. For patient **PAM USABILITY**, modify the lab order that was just created to **also** include a lab test for the following:
    a. **TSH, 3rd Generation**
2. Close and save the requisition.

Task 15: Create Medication Order, View Drug-Drug and Drug-Allergy Interventions

1. Patient **PAM USABILITY** complains of joint pain. You decide to prescribe **Naproxen 250mg, 1 tablet per day as needed for pain**. The patient requests that you call the prescription in to the pharmacy.
2. During prescribing, you notice the Drug-Drug Intervention alert between Naproxen and Lithium. You decide to instead prescribe **Acetaminophen 500mg tablet, once per day as needed for pain**.

Task 16: Adjust Severity Level of Drug-Drug/Drug-Allergy Interaction Warnings

1. During the last task, a warning message (Drug-Drug Interaction alert) was displayed while prescribing. You decide that you'd like to reduce the amount of Drug-Drug and Drug-Allergy Warnings that display while prescribing. In PCM, set your Override Warning alert to only prompt on Red, not Yellow.
2. Close the Options window and the Program Setup window.

Task 17: File and Reconcile CDA

1. Patient **PAM USABILITY** brought in summary information from another facility on a USB thumb drive. Your staff has copied the information from the drive to the inbox in PCM where inbound CDAs are waiting to be filed to charts.
2. Locate and select the CDA for patient **PAM USABILITY**.
3. File the CDA to her chart and perform the reconciliation now.
4. Reconcile the medications, allergies, and problems by adding the data from the CDA to her chart in PCM.

Task 18: Add Implantable Device

1. Patient **JIM USABILITY** has come into the office today and informed you that he has an implanted device. Add the following implantable device to the chart and "get" (retrieve) the associated device information:
    a. UDI: (01)00613994127631(21)613994127631

Task 19: Modify Implantable Device List

1. For patient **JIM USABILITY**, modify the Implantable Device List as follows:
    a. Mark the device previously added with a status of **Inactive**. Also note that the reason it was deactivated is because it was **Removed**.
2. Close the patient data tables.

Task 20: Create a New E-Prescription

1. For patient **JIM USABILITY**, you need to prescribe the following medication:
    a. Drug: **Doxycycline Hyclate 100mg capsule**
    b. Sig: **1 Capsule P.O. b.i.d.**
    c. Refills: **0**
    d. Dispense: **14**
2. Per his request, you submit the prescription electronically to his **default eRx pharmacy**.

Task 21: Approve an Electronic Refill Request

1. Every day, you monitor your tasks for electronic prescription refill requests. Today, there is an electronic refill request for patient **ELIZABETH ITASCA**.
2. **Approve** the electronic refill request as is.
3. Return it to the sending pharmacy.

Task 22: Process an Electronic Change Request

1. Every day, you monitor your tasks for electronic prescription change requests. Today, there is a change request for patient **GRANT CUSTER**.
2. **Approve** the electronic change request for 1 tablet three times per day after meals as needed for pain.

Task 23: Cancel E-Prescription

1. For patient **SUSANNE ADIRONDACK**, you need to cancel the previously submitted E-prescription for Hydrochlorothiazide 50 MG Tablet

Appendix 5: Informed Consent

Informed Consent

Prime Clinical Systems, Inc. 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 a number of tasks using the software and give your feedback. The study will last about 60 minutes. At the conclusion of the test, you will be compensated for your time.

Agreement

I understand and agree that as a voluntary participant in the present study conducted by Prime Clinical Systems 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 Prime Clinical Systems, Inc.

I understand and consent to the use and release of the recordings by Prime Clinical Systems, Inc. I understand that the information and recorded files are for research purposes only and that my name and identifying information will not be used for any purpose other than research. I relinquish any rights to the recordings and understand the recorded files may be copied and used by Prime Clinical Systems, Inc. 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 with outside of Prime Clinical Systems, Inc. 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 6: Non-Disclosure Agreement

Non-Disclosure Agreement

THIS AGREEMENT is entered into as of _____, 2018, between _____ ("the Participant") and the testing organization Prime Clinical Systems, Inc, located at 3675 E. Huntington Dr, Suite A, Pasadena, CA 91107.

The Participant acknowledges his or her voluntary participation in today's usability study may bring the Participant into possession of Confidential Information. The term "Confidential Information" means all technical and commercial information of a proprietary or confidential nature which is disclosed by Prime Clinical Systems, Inc., or otherwise acquired by the Participant, in the course of today's study.

By way of illustration, but not limitation, Confidential Information includes trade secrets, processes, formulae, data, know-how, products, designs, drawings, computer aided design files and other computer files, computer software, ideas, improvements, inventions, training methods and materials, marketing techniques, plans, strategies, budgets, financial information, or forecasts.

Any information the Participant acquires relating to this product during this study is confidential and proprietary to Prime Clinical Systems, Inc. and is being disclosed solely for the purposes of the Participant's participation in today's usability study. By signing this form, the Participant acknowledges that s/he will receive monetary compensation for feedback and will not disclose this confidential information obtained today to anyone else or any other organizations.

Participants printed name: _____

Signature: _____ **Date:** _____

Appendix 7: Satisfaction Survey

Satisfaction Survey

QUESTION	RESPONSE
What was your overall impression of this system?	
What aspects of the system did you like most?	
What aspects of the system did you like least?	
Were there any features that you were surprised to see?	
What features did you expect to encounter but did not see? That is, is there anything that is missing in this application?	
Compare this system to other systems you have used.	
Would you recommend this system to your colleagues?	

Appendix 8: System Usability Scale Questionnaire

SYSTEM USABILITY SCALE QUESTIONNAIRE

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

EHR Usability Test (EHRUT)

Patient Chart Manager 7.1

EHR Usability Test (EHRUT)

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

Product: Patient Chart Manager
Version: 7.1

Dates of Usability Test: November 11 – December 4, 2024

Date of Report: December 5, 2024

Report Prepared By: Prime Clinical Systems, Inc.
3675 E. Huntington Drive, Suite A
Pasadena, CA 91107

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EXECUTIVE SUMMARY

A usability test of Patient Chart Manager, version 7.1, Ambulatory EHR, was conducted November 11 – December 4, 2024 by Prime Clinical Systems. The purpose of this test was to test and validate the usability of the current user interface as it pertains to the Decision Support Interventions related features, and provide evidence of usability in the EHR Under Test (EHRUT).

During the usability test, eleven health IT users matching the target demographic criteria served as participants and used the EHRUT in simulated, but representative tasks.

This study collected performance data on 6 tasks in the following area, typically conducted on an EHR:

- 170.315(b)(11) Decision Support Interventions

During the various one-on-one usability tests, each participant was greeted by the administrator and asked to review and sign an Informed Consent and a Non-Disclosure Agreement (see Appendix 5 and Appendix 6, respectively); they were instructed that they could withdraw at any time. All participants were current users of Patient Chart Manager, although most had limited experience with most aspects of the above area. A Patient Chart Manager trainer provided a training session to each participant prior to each usability study. The administrator introduced the test, and instructed participants to complete a series of tasks (given one at a time) using the EHRUT. During the testing, the administrator timed the test and recorded user performance data electronically. The administrator did not give the participant assistance in how to complete the task except in areas of task instructions when the directions seemed unclear.

Participant screens and audio were recorded for subsequent analysis.

The following types of data were collected 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
- 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 and satisfaction survey. 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 Success		Path Deviation		Task Time				Task Errors		Likert Scale	
Task	**Total Participants**	**Total # of Successful Attempts**	**Mean (%)**	**Std Dev (%)**	**Observed # of Steps**	**Optimal # of Steps**	**Mean (seconds)**	**Std Dev (seconds)**	**Deviation Observed (seconds)**	**Deviation Optimal (seconds)**	**Task Errors Mean (%)**	**Task Errors Std Dev (%)**	**Rating**	**Std Dev**
Task 1.1: Update Procedures List (includes DSI for Procedures, EKG)	11	10	90.91	3.00	109	70	66	26	658	141	9.09	3.00	4.60	0.73
Task 2.1: Add Vital Signs (includes DSI for Vital Signs, Heart Rate)	11	5	45.45	5.00	75	70	76	31	379	246	54.55	5.00	4.40	0.81
Task 3.1: Add to the Problem List (includes DSI for Problems, SDOH)	10	9	90.00	3.00	75	70	58	15	525	162	10.00	3.00	4.70	0.95
Task 4.1: Expiration Date for Implantable Device (includes DSI for Implantable Device)	10	10	100.00	0.00	63	60	31	13	311	87	0.00	0.00	5.00	0.00
Task 5.1: Health Assessment (includes DSI for Health Assessment Scores)	11	11	100.00	0.00	68	66	26	10	290	93	0.00	0.00	5.00	0.00
Task 6.1: Audit Prev Services Hx Table and Print a Report (DSI feedback Availability & Export)	11	10	90.91	3.00	66	60	40	22	401	96	9.09	3.00	4.80	0.60

The results from the System Usability Scale scored the subjective satisfaction with the system based on performance with these tasks to be: 93.18[1].
In addition to the performance data, the following qualitative observations were made:

Major Findings

Overall, the majority of tasks had a 90-100% success rate, indicating that most participants could successfully complete what was asked of them. All tasks had an average rating of 4-5 out of 5 points, indicating a general satisfaction amongst most participants regarding the tasks. The Satisfaction Survey revealed that most participants find the EHR to be user friendly.

Patient Reminder Alerts: Most participants were not familiar with its functionality prior to training for the study, which led to an average 45% success rate. They struggled with locating where to complete the reminder alert, which led to them double-clicking to edit the alert, instead of right-clicking to view the drop down option to complete it.

Procedures List: Numerous deviations were caused by the participants attempting to type the procedure description into the drop down field - instead of selecting the procedure from the drop down list. Although all participants were trained on selecting from the drop down list, study observations suggested that a number of participants were attempting to find a faster way to locate the procedure instead of scrolling through the list.

Areas for Improvement

Prime Clinical Systems should consider the following improvements:

Patient Reminder Alerts:

- Proactive training and documentation on the Patient Reminder Alerts feature so that the end users hopefully acquire a better understanding of how the feature works.
- When double-clicking on a reminder alert, displaying the option to first choose whether the intent is to complete the alert or edit the alert.

Procedures List:

- Disallowing the ability to click in the drop down field and type.
- When clicking on the drop down field or hovering over the drop down field, displaying a helpful tip directing the user to click on the drop down arrow for the field.

1 See Tullis, T. & Albert, W. (2008). Measuring the User Experience. Burlington, MA: Morgan Kaufman (p. 149). Broadly interpreted, scores under 60 represent systems with poor usability; scores over 80 would be considered above average.

INTRODUCTION

The EHRUT tested for this study was Patient Chart Manager, version 7.1. Designed to present medical information to healthcare providers in ambulatory healthcare settings, the EHRUT allows healthcare IT users to electronically store and access data, make clinical decisions, document findings, electronically prescribe medicine, create lab and radiology orders, provide patient education, etc. 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 as it pertains to the Decision Support Interventions related features, and provide evidence of usability in the EHR Under Test (EHRUT). To this end, measures of effectiveness, efficiency and user satisfaction, such as time to perform each task, success rate, path deviations, number and type of errors, and ease of use, were captured during the usability testing.

METHOD

Design Standard

NISTIR 7741 UCD processes were employed in the Patient Chart Manager product design. NISTIR 7741 is a user-centered design (UCD) created for improving the usability of electronic health records (https://tsapps.nist.gov/publication/get_pdf.cfm?pub_id=907313).

Participants

A total of eleven participants were tested on the EHRUT. Participants in the test were various healthcare personnel. 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 a typical end user would have received.

For the test purposes, participants were recruited by Prime Clinical Systems staff. The recruitment was based on an internal knowledge of the end-users' willingness to learn and adapt to new EHR functionalities as well as their ability to provide constructive feedback on improving the EHR.

Recruited participants had a mix of backgrounds and demographic characteristics. 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/Role	Professional Experience (months)	Computer Experience (months)	PCM Product Experience (months)	Assistive Technology Needs
201	Female	20-29	Some college credit, no degree	Medical Assistant	48	180	48	No
202	Female	20-29	Some college credit, no degree	Clinical Medical Assistant	36	60	8	No
203	Female	50-59	Bachelor's degree	Assistant Manager	180	360	288	No
204	Female	30-39	Some college credit, no degree	Medical Biller	108	240	96	No
205	Female	40-49	Some college credit, no degree	Medical Biller	240	420	180	No
206	Female	30-39	Bachelor's degree	Office Manager	168	240	84	No
207	Female	30-39	Some college credit, no degree	PSR	216	240	36	No
208	Female	50-59	Bachelor's degree	Practice Manager	252	360	204	No
209	Female	40-49	Some college credit, no degree	Medical Biller	216	240	180	No
210	Female	30-39	Some college credit, no degree	Billing Manager	240	240	240	No
211	Male	60-69	Bachelor's degree	Administrator	480	540	132	No

Eleven participants (matching the demographics in the section on Participants) were recruited and participated in the usability study.

Participants were scheduled for 60 minute test sessions. A calendar was used to keep track of the participant schedule.

Study Design

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

During the usability test, participants interacted with one EHR. Each participant used the system in the same setup of a remote server accessed using an online meeting session, and was provided with the same instructions for their testing area. 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
- 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:

- Update Procedures List (includes DSI for Procedures, EKG)
- Add Vital Signs (includes DSI for Vital Signs, Heart Rate)
- Add to the Problem List (includes DSI for Problems, SDOH)
- Expiration Date for Implantable Device (includes DSI for Implantable Device)
- Health Assessment (includes DSI for Health Assessment Scores)
- Audit Prev Services Hx Table and Print a Report (DSI feedback Availability & Export)

Tasks were selected based on their frequency of use, criticality of function, and those that may be most troublesome for users. Tasks should always be constructed in light of the study objectives.

Procedure

Upon connection to the online meeting session, 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 and Non-Disclosure Agreement (see Appendix 5 and Appendix 6, respectively). The administrator witnessed the participant's signature.

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 errors and deviations.

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.

For each task, the participants were given a written copy of the task. Task timing began once the administrator finished reading the task description and stated "Start". The task time was stopped once the participant indicated they had successfully completed the task. Scoring is discussed below in the Data Scoring section.

Following the session, the administrator gave the participant the Satisfaction Survey and System Usability Scale Questionnaire (see Appendix 7 and Appendix 8, respectively) 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.

Participants were thanked for their time and compensated with a $100 gift card via UPS Ground.

Test Location

All participants were tested over an online meeting session.

Prior to the test session, the participant was asked to select a quiet location with minimal distractions, as well as a computer that could connect to the online meeting session. The administrator and participant were the only ones on the call.

Test Environment

The EHRUT would typically be used in a healthcare office or facility. In this instance, the testing was conducted over an online meeting session. The participants used a keyboard and mouse when interacting with the EHRUT.

The Patient Chart Manager application was running in a test environment on Windows Server 2012 R2 Standard with 1440 x 900 screen resolution. Technically, the system performance (i.e. response time) was representative to what actual users would experience in a field implementation.

Test Forms and Tools

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

- Participant Questionnaire
- Informed Consent
- Non-Disclosure Agreement
- Moderator's Guide
- Task Instructions
- Satisfaction Survey
- System Usability Scale Questionnaire

Examples of these documents can be found in the Appendices. The Moderator's Guide was devised so as to be able to capture required data.

The participant's audio and interaction with the EHRUT was captured and recorded digitally with audio and screen capture software running on the online meeting session.

Participant Instructions

The administrator reads the following instructions aloud to each participant (also see the full Moderator's Guide in Appendix 3):

> *Thank you for taking the time to participate in this study. Our session today will last about 60 minutes. During that time, you will be performing a number of tasks in the Patient Chart Manager software.*

You will be asked to complete these tasks on your own, trying to do them as quickly as possible with the fewest possible errors or deviations. Don't do anything more than what is asked. And please note that we are not testing you, we are testing the system. We are interested in how easy or difficult this system is to use, what in it would be useful to you, and how we could improve it.

I will be here in case you need specific help, but I may not be able to instruct you or provide help in how to use the software.

We realize you are helping us; and should you feel it necessary, you are able to withdraw at any time during the testing for any reason.

We are recording both the screen and audio of our session today. All of the information that you provide will be kept confidential and your name will not be associated with your comments at any time. At this time, I'd like to have you read and sign simple permission forms.

Have participant read/sign Informed Consent and Non-Disclosure Agreement

Getting started, the process will be as follows for each task:
I will read the description of the task and ask you to begin.
Please start the task only when I say 'Start'.
And then say 'Done' when you believe you are finished with the task.
There will be a few tasks towards the end where I'll log into the software as different users for you to complete the tasks.
I'll ask you a couple of questions for feedback and then we'll move on to the next task.
At the end of testing, there will be a couple of quick surveys for you to complete.

Before we begin testing – have you printed your Test Scenarios? Please note that the test scenarios contain the details you'll need to know in order to complete the task, for example, what allergy to add to the chart or what demographic to edit, etc.

Participants were then given their set of tasks to complete. Tasks are listed in the Moderator's Guide and Task Instructions (See Appendix 3 and Appendix 4, respectively).

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:

- Effectiveness of Patient Chart Manager by measuring participant success rates and errors
- Efficiency of Patient Chart Manager by measuring the average task time and path deviations
- Satisfaction with Patient Chart Manager 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 were recorded in a spreadsheet and operationally defined by 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 __ seconds then allotted task time performance was __ 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 "Start" 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 Patient Chart Manager overall, the testing team administered the System Usability Scale (SUS) post-test questionnaire. Questions included, "I think I would like to use this system frequently," "I thought the system was easy to use," and "I would imagine that most people would learn to use this system very quickly." See full System Usability Scale questionnaire in the Appendix.

RESULTS

Data Analysis and Reporting

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

The usability testing results for the EHRUT are detailed below. The results should be seen in light of the objectives and goals outlined in the Study Design section.

			Task Success		Path Deviation		Task Time				Task Errors		Likert Scale	
Task	**Total Participants**	**Total # of Successful Attempts**	**Mean (%)**	**Std Dev (%)**	**Observed # of Steps**	**Optimal # of Steps**	**Mean (seconds)**	**Std Dev (seconds)**	**Deviation Observed (seconds)**	**Deviation Optimal (seconds)**	**Task Errors Mean (%)**	**Task Errors Std Dev (%)**	**Rating**	**Std Dev**
Task 1.1: Update Procedures List (includes DSI for Procedures, EKG)	11	10	90.91	3.00	109	70	66	26	658	141	9.09	3.00	4.60	0.73
Task 2.1: Add Vital Signs (includes DSI for Vital Signs, Heart Rate)	11	5	45.45	5.00	75	70	76	31	379	246	54.55	5.00	4.40	0.81
Task 3.1: Add to the Problem List (includes DSI for Problems, SDOH)	10	9	90.00	3.00	75	70	58	15	525	162	10.00	3.00	4.70	0.95
Task 4.1: Expiration Date for Implantable Device (includes DSI for Implantable Device)	10	10	100.00	0.00	63	60	31	13	311	87	0.00	0.00	5.00	0.00
Task 5.1: Health Assessment (includes DSI for Health Assessment Scores)	11	11	100.00	0.00	68	66	26	10	290	93	0.00	0.00	5.00	0.00
Task 6.1: Audit Prev Services Hx Table and Print a Report (DSI feedback Availability & Export)	11	10	90.91	3.00	66	60	40	22	401	96	9.09	3.00	4.80	0.60

The results from the SUS (System Usability Scale) scored the subjective satisfaction with the system based on performance with these tasks to be: 93.18. Broadly interpreted, scores under 60 represent systems with poor usability; scores over 80 would be considered above average.

DISCUSSION OF THE FINDINGS

170.315(b)(11) Decision Support Interventions – Task 1.1

Effectiveness: The average success rate for the first task associated with (b)(11) Decision Support Interventions was 90%. Only one participant failed the task, and it was due to them not completing the task within the allotted time. The path deviations were mostly due to the participants being unfamiliar with how to select the procedures from the Procedures pane. The unfamiliarity led to participants adding extra steps while searching for where and how to enter data. Despite being unfamiliar, however, the successful participants were able to eventually determine how to complete the task within the allotted time.

Efficiency: The task had a wide range of task times and deviations. This was likely due to participants being unfamiliar with the Procedures pane in Patient Chart Manager and requiring more time to determine how to enter data.

Satisfaction: The participants rated the task rather well for ease of use. The average rating for the task ranged between 3 to 5 out of 5 points. The participants who were successful rated the task as either Somewhat Easy or Very Easy.

170.315(b)(11) Decision Support Interventions – Task 2.1

Effectiveness: The average success rate for the second task associated with (b)(11) Decision Support Interventions was 45%. The task failures were mainly due to the participants not being familiar enough with how to complete patient reminder alerts. One participant failed because they did not initially access the correct chart, which led to the inability to complete the task. The path deviations were minimal with only one of the five successful participants going several steps past the optimal step count.

Efficiency: The task had a varying range of task times. Path deviations for the task, however, were very minimal. The participants who met the optimal step count were closer in task times, and the participant who went over the optimal step count had a longer task time.

Satisfaction: The participants rated the task fairly well for ease of use. The average rating for the task ranged between 3 to 5 out of 5 points.

170.315(b)(11) Decision Support Interventions – Task 3.1

Effectiveness: The average success rate for the third task associated with (b)(11) Decision Support Interventions was 90%. Only one participant failed the task, and it was due to them not completing the task within the allotted time. For this task, 50% of the successful participants completed the tasks within the optimal step count. Of the participants who went beyond the optimal step count - two were only

one step beyond the optimal step count and an additional two were five steps beyond the optimal step count.

Efficiency: This task had a wide range of task times. Path deviations were rather minimal, however, with only two participants going a notable amount of steps past the optimal step count.

Satisfaction: The average rating for this task was 4.7 out of 5 points. All successful participants rated the task as Very Easy.

170.315(b)(11) Decision Support Interventions – Task 4.1

Effectiveness: The fourth task associated with (b)(11) Decision Support Interventions had a 100% success rate. Path deviations for this task were quite minimal. All but one of the participants completed it with the optimal step count. One participant was three steps beyond the optimal step count.

Efficiency: The majority of task times were relatively similar. There was, however, one task time that was noticeably higher than the other times. Path deviations were very minimal for this task.

Satisfaction: All participants rated this task with 5 out of 5 points.

170.315(b)(11) Decision Support Interventions – Task 5.1

Effectiveness: The fifth task associated with (b)(11) Decision Support Interventions had a 100% success rate. Path deviations for this task were very minimal. All but one of the participants completed it with the optimal step count. One participant was only two steps beyond the optimal step count.

Efficiency: The majority of task times were relatively similar. There were, however, two task times that was noticeably higher than the other times. Path deviations were very minimal for this task.

Satisfaction: All participants rated this task with 5 out of 5 points.

170.315(b)(11) Decision Support Interventions – Task 6.1

Effectiveness: The average success rate for the sixth task associated with (b)(11) Decision Support Interventions was 90%. One participant did not complete the task due to being uncertain of where to access the required information and eventually giving up. For this task, 80% of participants completed the task within the optimal step count, with two participants taking three steps more than the optimal step count.

Efficiency: The majority of task times were relatively similar. There were, however, two task times that were noticeably higher than the other times. Path deviations were very minimal for this task.

Satisfaction: The average rating for this task was 4.7 out of 5 points. All successful participants rated the task as Very Easy.

Major Findings

Overall, the majority of tasks had a 90-100% success rate, indicating that most participants could successfully complete what was asked of them. All tasks had an average rating of 4-5 out of 5 points, indicating a general satisfaction amongst most participants regarding the tasks. The Satisfaction Survey revealed that most participants find the EHR to be user friendly.

Patient Reminder Alerts: Most participants were not familiar with its functionality prior to training for the test, which led to an average 45% success rate. They struggled with locating where to complete the reminder alert, which led to them double-clicking to edit the alert, instead of right-clicking to view the drop down option to complete it.

Procedures List: Numerous deviations were caused by the participants attempting to type the procedure description into the drop down field - instead of selecting the procedure from the drop down list. Although all participants were trained on selecting from the drop down list, study observations suggested that a number of participants were attempting to find a faster way to locate the procedure instead of scrolling through the list.

Areas for Improvement

Prime Clinical Systems should consider the following improvements:

Patient Reminder Alerts:

- Proactive training and documentation on the Patient Reminder Alerts feature so that the end users hopefully acquire a better understanding of how the feature works.
- When double-clicking on a reminder alert, the option to first choose whether the intent is to complete the alert or edit the alert.

Procedures List:

- Disallowing the ability to click in the drop down field and type.

When clicking on the drop down field or hovering over the drop down field, displaying a helpful tip directing the user to click on the drop down arrow for the field.

APPENDICES

Appendix 1: Participant Demographics

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

Participant Gender	Count
Male	1
Female	10

Participant Age	Count
20-29	2
30-39	4
40-49	2
50-59	2
60-69	1

Participant Education	Count
High School	0
Some College credit, no degree	7
Bachelor's degree	4

Participant Occupation/Role	Count
Practice Manager	4
Billing Manager	1
Medical Assistant	2
Billing	3
Patient Service Rep	1

Participant Professional Experience	Months
Average	198

Participant Computer Experience	Months
Average	284

Participant Product Experience	Months
Average	136

Appendix 2: Participant Questionnaire

PARTICIPANT QUESTIONNAIRE

1. Name: _____

2. Direct Phone Number: _____

3. Email Address: _____

4. Gender: [ ] Male [ ] Female [ ] Other

5. Age: [ ] 19 or younger [ ] 50-59
[ ] 20-29 [ ] 60-69
[ ] 30-39 [ ] 70-79
[ ] 40-49 [ ] 80 or older

6. Education level: [ ] High School [ ] Some College [ ] College

7. Have you participated in a focus group or usability test in the past 6 months? [ ] Yes [ ] No

8. Do you, or does anyone in your home, have a commercial or research interest in an electronic health record software or consulting company? [ ] Yes [ ] No

9. Do you require any assistive technologies to use a computer? [ ] Yes [ ] No

If yes, please describe: _____

10. What is your occupation or role? _____

11. How many years of professional experience do you have in this role? _____

12. How many years of computer experience do you have? _____

13. How would you describe your computer experience? [ ] Novice [ ] Intermediate [ ] Expert

14. How many months or years have you worked with Patient Chart Manager? _____

Appendix 3: Moderator Guide

Patient Chart Manager Usability Test

Moderator Guide

Administrator: _____

Date and Time: _____

Participant #: _____

Location: Remote webinar (Go To Meeting)

Orientation:

Thank you for taking the time to participate in this study. Our session today will last about XX minutes. During that time, you will be performing a number of tasks in the Patient Chart Manager software.

You will be asked to complete these tasks on your own, trying to do them as quickly as possible with the fewest possible errors or deviations. Don't do anything more than what is asked. And please note that we are not testing you, we are testing the system. We are interested in how easy or difficult this system is to use, what in it would be useful to you, and how we could improve it.

I will be here in case you need specific help, but I may not be able to instruct you or provide help in how to use the software.

We realize you are helping us; and should you feel it necessary, you are able to withdraw at any time during the testing for any reason.

We are recording both the screen and audio of our session today. All of the information that you provide will be kept confidential and your name will not be associated with your comments at any time. At this time, I'd like to have you read and sign simple permission forms.

Have participant read/sign Informed Consent and Non-Disclosure Agreement

Getting started, the process will be as follows for each task:
I will read the description of the task and ask you to begin.
Please start the task only when I say 'Start'.
And then say 'Done' when you believe you are finished with the task.

There will be a few tasks towards the end where I'll log into the software as different users for you to complete the tasks.
I'll ask you a couple of questions for feedback and then we'll move on to the next task.
At the end of testing, there will be a couple of quick surveys for you to complete.

Before we begin testing – have you printed your Test Scenarios? Please note that the test scenarios contain the details you'll need to know in order to complete the task.

Task 1.1: Update Procedures List (includes DSI for Procedures, EKG)

Patient < **Adam Usability** > is complaining of chest pain, so an in-office EKG is performed. Open the patient's chart and record the EKG in the patient's Procedure List with procedure code 93000 (for EKG). Confirm the "EKG Procedure" alert was automatically added to the Patient Reminders screen. Close the patient's chart.

PATH(S) TO COMPLETION:	
Optimal Path: 1. Click in the Patient Search field 2. Type the patient name and press Enter 3. Select patient from search results (chart opens) 4. Select CPT 93000 from the PR Code dropdown	**Optimal Path con't:** 5. Open Patient Reminders to review the reminder was added 6. Close the Patient Reminders window 7. Close the patient's chart

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Task 2.1: Add Vital Signs (includes DSI for Vital Signs, Heart Rate)

It's been discovered that patient < **Ben Usability** > had an incorrect pulse recorded in the Vital Signs data table in the patient's chart. Open the patient's chart and update the pulse to **125 BPM**. Upon closing the data tables window, the system alerts you that new Reminder Alerts have been added to the chart. Confirm the Increased Heart rate alert was added to the Patient Reminders screen. Complete the alert, noting that the patient has been counseled on an increased heart rate.

PATH(S) TO COMPLETION:	
Optimal Path: 1. Click in the Patient Search field 2. Type the patient name and press Enter 3. Select patient from search results (chart opens) 4. Open the Patient Data Tables (opens to Vital Signs) 5. Update Pulse to 125 6. Close the Patient Data Tables 7. Click OK to show the Patient Reminders window 8. Select Increased Heart Rate and right-click	**Optimal Path con't:** 9. Select Complete Item 10. Click OK to complete 11. Enter the note for completion (counseled) 12. Click OK to close the comment window 13. Close the Patient Reminders window 14. Close the patient's chart

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Task 3.1: Add to the Problem List (DSI for SDOH, Problems)

Patient < **Crystal Usability** > is seen in the office, and upon completion of a Social Determinants of Health (SDOH) questionnaire, they report feeling overwhelmed due to a very stressful work schedule. Open the patient's chart and add ICD10 Z563 (for Stressful Work Schedule) to the patient's Problem List. The "Stressful Work Schedule" alert is automatically added to the Patient Reminders. Confirm the Stressful Work alert has been added to the Patient Reminders screen, and close the chart.

PATH(S) TO COMPLETION:	
Optimal Path: 1. Click in the Patient Search field 2. Type the patient name and press Enter 3. Select patient from search results (chart opens) 4. Select Z563 from the ICD10 dropdown	**Optimal Path con't:** 5. Open Patient Reminders to review the reminder was added 6. Close the Patient Reminders window 7. Close the chart

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Task 4.1: Expiration Date for Implantable Device (DSI for Implantable Devices)

Patient < **Denise Usability** > has a pacemaker. Open the patient's chart and review the patient reminder that was automatically added based upon the pacemaker expiration date. Close the Patient Reminders window, and close the chart.

PATH(S) TO COMPLETION:	
Optimal Path: 1. Click in the Patient Search field 2. Type the patient name and press Enter 3. Select patient from search results (chart opens) 4. Review the reminder in the Patient Reminders window	**Optimal Path con't:** 5. Close Patient Reminder window 6. Close chart

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Task 5.1: Health Assessment (DSI for Health Assessment Scores)

Patient < **Edgar Usability** > had a PHQ-9 Health Assessment done for depression screening in your office and the staff had recorded a score greater than 10 in the patient data tables. Open the patient's chart to confirm that an alert for the high PHQ-9 score was automatically added to the Patient Reminders window. Close the Patient Reminders window, and then close the chart.

PATH(S) TO COMPLETION:	
Optimal Path: 1. Click in the Patient Search field 2. Type the patient name and press Enter 3. Select patient from search results (chart opens) 4. Review the reminder in the Patient Reminders window	**Optimal Path con't:** 5. Close the Patient Reminders window 6. Close the chart

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Task 6.1: Audit Prev Services Hx Table and Print a Report (DSI Feedback Availability &Export)

Periodically, an audit is performed to export the feedback and actions taken to add and complete the Preventive Service reminders and alerts in patient charts. Export the Prev Services Hx data table (for all patients, not a specific chart), and save the file to the workstation with the default file name that the system provides.

PATH(S) TO COMPLETION:	
Optimal Path: 1. Open the Patient Data Tables 2. Select the Prev Services Hx tab 3. Click Exp to Excel and xml	**Optimal Path con't:** 4. Click Save 5. Click OK 6. Close the data tables

Notes on the participant's path to completion, including deviations and errors:

Time:

Task completion:

1 – Successful, no deviations, 2 – Successful, with deviations,

3 – Failed, time issue, 4 – Failed, incomplete

Moderator's Observation:

Post-Task Survey

Overall, would you say this task was:

1 – Very easy, 2 – Somewhat easy, 3 – Neither easy nor difficult,

4 – Somewhat difficult, 5 – Very difficult

Participant Answer:

Appendix 4: Task Instructions

USABILITY STUDY TASKS

Task 1.1: Update Procedures List

Patient < **Adam Usability** > is complaining of chest pain, so an in-office EKG is performed. Open the patient's chart and record the EKG in the patient's Procedure List with procedure code 93000 (for EKG). Confirm the "EKG Procedure" alert was automatically added to the Patient Reminders screen. Close the patient's chart.

Task 2.1: Update Vital Signs

It's been discovered that patient < **Ben Usability** > had an incorrect pulse recorded in the Vital Signs data table in the patient's chart. Open the patient's chart and update the pulse to **125 BPM**. Upon closing the data tables window, the system alerts you that new Reminder Alerts have been added to the chart. Confirm the Increased Heart rate alert was added to the Patient Reminders screen. Complete the alert, noting that the patient has been counseled on an increased heart rate.

Task 3.1: Add to the Problem List

Patient < **Crystal Usability** > is seen in the office, and upon completion of a Social Determinants of Health (SDOH) questionnaire, they report feeling overwhelmed due to a very stressful work schedule. Open the patient's chart and add ICD10 Z563 (for Stressful Work Schedule) to the patient's Problem List. The "Stressful Work Schedule" alert is automatically added to the Patient Reminders. Confirm the Stressful Work alert has been added to the Patient Reminders screen, and close the chart.

Task 4.1: Expiration Date for Implantable Device

Patient < **Denise Usability** > has a pacemaker. Open the patient's chart and review the patient reminder that was automatically added based upon the pacemaker expiration date. Close the Patient Reminders window, and close the chart.

Task 5.1: Health Assessment Reminder

Patient <**Edgar Usability** > had a PHQ-9 Health Assessment done for depression screening in your office and the staff had recorded a score greater than 10 in the patient data tables. Open the patient's chart to confirm that an alert for the high PHQ-9 score was automatically added to the Patient Reminders window. Close the Patient Reminders window, and then close the chart.

Task 6.1: Audit Prev Services Hx Data Table and Print a Report

Periodically, an audit is performed to export the feedback and actions taken to add and complete the Preventive Service reminders and alerts in patient charts. Export the Prev Services Hx data table (for all patients, not a specific chart), and save the file to the workstation with the default file name that the system provides.

Appendix 5: Informed Consent

Informed Consent

Prime Clinical Systems, Inc. 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 a number of tasks using the software and give your feedback. The study will last about 60 minutes. At the conclusion of the test, you will be compensated for your time.

Agreement

I understand and agree that as a voluntary participant in the present study conducted by Prime Clinical Systems 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 Prime Clinical Systems, Inc.

I understand and consent to the use and release of the recordings by Prime Clinical Systems, Inc. I understand that the information and recorded files are for research purposes only and that my name and identifying information will not be used for any purpose other than research. I relinquish any rights to the recordings and understand the recorded files may be copied and used by Prime Clinical Systems, Inc. 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 with outside of Prime Clinical Systems, Inc. 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 6: Non-Disclosure Agreement

Non-Disclosure Agreement

THIS AGREEMENT is entered into as of _____, 2018, between _____ ("the Participant") and the testing organization Prime Clinical Systems, Inc, located at 3675 E. Huntington Dr, Suite A, Pasadena, CA 91107.

The Participant acknowledges his or her voluntary participation in today's usability study may bring the Participant into possession of Confidential Information. The term "Confidential Information" means all technical and commercial information of a proprietary or confidential nature which is disclosed by Prime Clinical Systems, Inc., or otherwise acquired by the Participant, in the course of today's study.

By way of illustration, but not limitation, Confidential Information includes trade secrets, processes, formulae, data, know-how, products, designs, drawings, computer aided design files and other computer files, computer software, ideas, improvements, inventions, training methods and materials, marketing techniques, plans, strategies, budgets, financial information, or forecasts.

Any information the Participant acquires relating to this product during this study is confidential and proprietary to Prime Clinical Systems, Inc. and is being disclosed solely for the purposes of the Participant's participation in today's usability study. By signing this form, the Participant acknowledges that s/he will receive monetary compensation for feedback and will not disclose this confidential information obtained today to anyone else or any other organizations.

Participants printed name: _____

Signature: _____ **Date:** _____

Appendix 7: Satisfaction Survey

Satisfaction Survey

QUESTION	RESPONSE
What was your overall impression of this system?	
What aspects of the system did you like most?	
What aspects of the system did you like least?	
Were there any features that you were surprised to see?	
What features did you expect to encounter but did not see? That is, is there anything that is missing in this application?	
Compare this system to other systems you have used.	
Would you recommend this system to your colleagues?	

Appendix 8: System Usability Scale Questionnaire

SYSTEM USABILITY SCALE QUESTIONNAIRE

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