Electronic Health Record Usability Test Report: PhyGeneSys 5.0

EHR Usability Test Report of

PhyGeneSys EHR 5.0

Report based on NISTIR 7742 Customized Common Industry Format Template for Electronic Health Record Usability Testing

PhyGeneSys EHR 5.0

Date of Usability Test: November 10th – December 10th, 2018

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EXECUTIVE SUMMARY

A usability test of PhyGeneSys 5.0 from PHI Medical Office Solutions, an ambulatory electronic health record software, was conducted between the dates of November 10th, 2018 and December 10th, 2018 in Shawnee, KS by PHI Medical Office Solutions. Five subjects were tested at a local setting and five subjects were tested over remote tele-conferencing sessions using FastSupport.

 The purpose of this test was to test and validate the usability of the current user interface and provide evidence of usability of PhyGeneSys EHR 5.0 in the EHR Under Test (EHRUT).

During the usability test, ten (10) healthcare providers and clinical staff matching the target demographic criteria served as participants and used the EHRUT in simulated, but representative tasks.

This study collected performance data on 11 tasks typically conducted on an EHR. The tasks are associated to 11 certification criteria identified in 45 CFR Par 170 Subpart C of the Health Information Technology: 2015 Edition Health Information Technology (Health IT) Certification Criteria of 170.315(g)(3) Safety-Enhanced Design. The certification criteria covered is as follows:

170.315(a)(1) Computerized Provider Order Entry - Medications

170.315(a)(2) Computerized Provider Order Entry - Laboratory

170.315(a)(3) Computerized Provider Order Entry - Radiology

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

170.315(a)(5) Demographics

170.315(a)(6) Problem List

170.315(a)(8) Medication Allergy List

170.315(a)(9) Clinical Decision Support

170.315(a)(14) Implantable Device List

170.315(b)(2) Clinical information reconciliation and Incorporation

During the 60-minute one-on-one usability test, each participant was greeted by the administrator and were asked to sign an informed consent/release form (included in Appendix 3); they were instructed that they could withdraw at any time. All participants had prior experience with other EHR Systems but no experience with the system under test.

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 on paper and electronically. The administrator did not give the participant assistance in how to complete the task.

The following types of quantitative 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 if any**
- **Participant's satisfaction ratings of the system (SUS)**

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 but were not compensated.

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. The following is a summary of the performance and rating data collected on the EHRUT.

1.1 Summary

Measure / Task	N	Effectiveness Task Success		Efficiency Path Deviation # of Steps		Efficiency Task Time (Seconds)			Effectiveness Errors		Satisfaction Task Ratings
	#	Mean (%)	SD	Optimal	Observed (Mean)	Opt.	Mean	SD	Mean	SD	5=Easy
CPOE Medications											
Scenario a.1.1: Record a medication order via CPOE	10	100	0	8	8	36	42.5	2.9	0	0	4.6
Scenario a.1.2: Change medication via CPOE	10	100	0	10	10	17	22.6	4.9	0	0	4.6
Scenario a.1.3: Display Changed CPOE Medication Order	10	100	0	1	1	5	5.4	0.5	0	0	5
CPOE Radiology											
Scenario a.2.1: Record Lab order via CPOE	10	100	0	6	6	35	32.4	1.6	0	0	4.7
Scenario a.2.2: Change Lab order via CPOE	10	100	0	6	6	8	8.4	0.5	0	0	4.7
Scenario a.2.3: Display changed CPOE Lab Order	10	100	0	1	1	3	2.3	0.5	0	0	5
CPOE Laboratory											
Scenario a.3.1: Record Imaging order via CPOE	10	100	0	8	8	30	31.9	1	0	0	4.6
Scenario a.3.2: Change Imaging order via CPOE	10	100	0	5	5	8	8.3	0.5	0	0	4.6
Scenario a.3.3: Display changed CPOE Imaging Order	10	100	0	1	1	2	2	0	0	0	5
Drug-Drug, Drug-Allergy Interaction Checks											
Scenario a.4.1: Using CPOE, trigger a drug-drug interaction by adding a new medication order	10	100	0	8	8.5	36	39.1	1.5	0	0	4.3
Scenario a.4.2: Using CPOE, trigger a drug-	10	100	0	7	7.5	36	39.3	2.6	0	0	4.3

allergy interaction by entering a new medication order											
Scenario a.4.3: Adjust the severity level of a displayed drug-drug interaction	10	100	0	6	6.5	17	17.3	0.9	0	0	4.4
Demographics											
Scenario a.5.1: Record a patient's preferred language, date of birth, birth sex, race, ethnicity, 95sexual o11rientation, and gender identity	10	100	0	9	9	30	31	0.8	0	0	4.8
Scenario a5.2: Change the patient's preferred language, date of birth, birth sex, race, ethnicity, sexual orientation, 1and gender identity	10	100	0	9	9	25	25.7	0.7	0	0	4.8
Scenario a.5.3: Display the patient's changed preferred language, date of birth, birth sex, race, ethnicity, sexual orientation and gender identity	10	100	0	1	1	5	5.2	0.4	0	0	5
Problem List											
Scenario a6.1: Record a problem to the problem list	10	100	0	7	7	37	40	1.6	0	0	5
Scenario a.6.2: Change a problem on the problem list	10	100	0	3	3	5	6.1	0.6	0	0	5
Scenario a.6.3: Display the active problem list	10	100	0	1	1	6	5.8	0.6	0	0	5
Scenario a.6.4: Display the historical problem list	10	100	0	1	1	2	2	0	0	0	5
Medications List											
Scenario a.7.1: Record a medication to the medication list	10	100	0	8	8.3	36	40.7	1.7	0	0	4.2
Scenario a.7.2: Change a medication on the medication list	10	100	0	10	10.4	18	19.2	1	0	0	4.2
Scenario a.7.3: Display the active medication list	10	100	0	1	1	5	8.6	0.7	0	0	5
Scenario a.7.4: Display the historical medication list	10	100	0	1	1	2	2	0	0	0	5
Medication Allergy List											
Scenario a.8.1: Record a medication allergy	10	100	0	7	7.2	70	73.7	3	0	0	4.2
Scenario a.8.2: Change a medication allergy	10	100	0	4	4.2	5	5.9	0.9	0	0	4.2

Scenario											
Scenario a.8.3: Display the active medication allergy list	10	100	0	1	1	8	8.3	0.5	0	0	5
Scenario a.8.4: Display the historical medication allergy list	10	100	0	1	1	2	2	0	0	0	5
Clinical Decision Support											
Scenario a.9.1: Add a CDS intervention and/or reference resource for each of the required elements (Problem list, Medication list, Medication Allergy list, at least one Demographic, Laboratory Test, Vital Signs, and a combination of at least 2 of the elements listed above	10	100	0	14	14.9	45	47.4	1.7	0	0	4.2
Scenario a.9.2: Trigger a CDS interventions/resources added using the applicable data elements from each of the required elements	10	100	0	7	8	25	26.7	1.6	0	0	4.2
Scenario a.9.3: View the intervention/resource information using the standard for data elements in the Problem List, Medication List, and Demographics	10	100	0	2	2	16	19.1	0.7	0	0	5
Scenario a.9.4: Trigger the CDS interventions/resources based on data elements in the Problem List, Medication List, and Medication Allergy list by incorporating patient information from a transition of care/referral summary	10	100	0	18	18.8	135	147.4	5.5	0	0	5
Scenario a.9.5: Access the following attributes for one of the triggered CDS interventions/resources: bibliographic citation, developer, funding source, release/revision date	10	100	0	4	4	15	18.7	1.5	0	0	5
Implantable Device List											

Scenario a.14.1: Record UDI	10	100	0	6	6	46	49.9	2.2	0	0	5
Scenario a.14.2: Change UDI Status	10	100	0	4	4	5	5	0	0	0	5
Scenario a.14.3: Access UDI, device description, identifiers, and attributes	10	100	0	1	1	2	2	0	0	0	5
Clinical Information Reconciliation and Incorporation										
Scenario b.2.1: Incorporate a CCDA and conduct reconciliation of the medications, medication allergies, and problems in the CCDA with the information currently in the patient's record	10	100	0	22	22	280	306.3	11.4	0	0	4.5
Scenario b.2.2: Generate a new CCDA with reconciled data	10	100	0	5	5	60	65.2	3.2	0	0	4.6

The results from the System Usability Scale scored the subjective satisfaction with the system based on performance with these tasks to be: 89.5

Major findings

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

- Based on feedback, participants found the layout familiar to use from utilizing other products with similar layout design.

- Participants seemed to quickly grasp how to use PhyGeneSys's EHR.

- Participants completed testing at a high mean successful task completion rate with an overall average of 100%, indicating that participants had little to no difficulty in completing the tasks.

- Participants found header icons easy to identify.

- Participants gave positive feedback on utilizing the Overview Report to locate information and place orders within the system.

- Participants welcomed the Left to Right workflow with the Overview Report on the Right Side.

- Clinical Information Reconciliation was described as the most difficult task to complete with the most steps

- Observed task times were lower than expected.

Areas for Improvement

Findings from the testing also found the following

- One participant requested larger buttons for placing orders.

- One participant requested a consistent location for Order Buttons (one screen has the buttons on the left, while all others are located on the right).

- Several participants requested fewer clicks for adding medications (we utilize a third-party vendor, placing this request out of our control).

- Several participants requested that Providers are given clear indication of the required fields.

- Consider more intuitive smart defaults that allow flexible data input of medications, allergies, labs, and diagnosis

INTRODUCTION TO THE ELECTRONIC HEALTH RECORD USABILITY TEST

The EHRUT(s) tested for this study was PhyGeneSys 5.0. Designed to present medical information to healthcare providers in ambulatory facilities and surgical center settings, the EHRUT consists of Practice Management/Scheduling, Billing, and EHR functionality. The usability testing attempted to represent realistic exercises and conditions.

The purpose of this study was to test and validate the usability of the PhyGeneSys EHR 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 on task, task success and optimal task path deviation were captured during the usability testing. Satisfaction and user confidence were assessed using the System Usability Scale (SUS) satisfaction questionnaire.

METHOD

PARTICIPANTS

A total of 10 participants were tested on the EHRUT(s). Participants in the test were nurses, medical assistants, and clinical staff. In addition, participants had no direct connection to the development of or organization producing the EHRUT(s). Participants were not from the testing or supplier organization. Participants were given the opportunity to have the same orientation and level of training as the actual end users would have received.

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)	Product Experience (months)	Assistive Technology Needs
1	F	30-39	Bachelors	Registered Nurse	120	150	0	None
2	M	40-49	Bachelors	Registered Nurse	150	180	0	None
3	F	40-49	Bachelors	Registered Nurse	180	200	0	None
4	F	30-39	Bachelors	Registered Nurse	100	120	0	None
5	F	20-29	Bachelors	Clinical Social Worker	12	100	0	None
6	F	30-39	Masters	CRNA	156	160	0	None
7	F	20-29	Doctorate	Physical Therapist	24	48	0	None
8	F	20-29	Bachelors	Dental Hygienist	12	48	0	None
9	F	30-39	Associate	Registered Nurse	18	56	0	None
10	M	30-39	Bachelors	Registered Nurse	48	60	0	None

10 participants (matching the demographics in the section on participants) were recruited and 10 participated in the usability test. 0 participants failed to show for the study.

Participants were scheduled for 60-minute sessions with varied time in between each session for debrief by the administrator(s) and data logger(s) and for system reset to proper test conditions. A spreadsheet was used to keep track of the participant schedule and included each participant's demographic characteristics.

STUDY DESIGN

Overall, the objective of this test was to uncover areas where the application performed well – that is, Effectively, Efficiently, and with Satisfaction – and areas where the application failed to meet the needs of the participants. The data from this test may serve as a baseline for future tests with an updated version of the same EHR 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 it also to identify areas where improvements must be made.

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

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

Additional information about the various measures can be found in the Usability Metrics section of this report.

TASKS

Eleven (11) tasks were designed based on the 2015 Editions Health IT Certification criteria and were based on the criticality of the function and frequency of use. Several tasks were constructed that would be realistic and representative of the kinds of activities a user might do with this EHR. The tasks were selected based on 11 ONC CEHRT2015 certification criteria, taking into consideration their frequency of use, criticality of function, potential for risk to patient safety, and those that may be most troublesome for users. For Task Rating, see the Table in 1.2.

As part of the task construction, the tasks listed below were prioritized in accordance with what we suspected the highest risk to be associated with use errors. Tasks that are bold in the list below were identified to be highest priority related to risk based on this exercise. This ranking of perceived risk took place before the testing began:

1. **Reconciling specific clinical information (Medications, Problems, Allergies) based on the information provided**
2. **Adding Medications to the Medication list**
3. **Adding Medication Allergies to the Allergy list**
4. **Ordering Medications for a Patient & Verifying Drug-Drug, and Drug-Allergy Interactions**
5. Adding items to the patient's problem list
6. Querying Medline Plus for Clinical Decision Support Information
7. Ordering Labs on a Patient
8. Ordering Radiological Diagnostic Exams

9. Documenting patient reported Implants
10. Updating and Modifying Demographic Information

PROCEDURES

Upon arrival and starting of remote connections FastSupport sessions, 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 release form (See Appendix 3). A representative from the test team witnessed the participant's signature.

The usability testing staff conducting the test was experienced usability practitioners with a background in Nursing and over 10 years of experience in the Health IT sector, backgrounds in healthcare, working on a number of the top EHR's in the market today.

The administrator moderated the session including administering instructions and tasks. The administrator also monitored task times, obtained post-task rating data, took notes on participant comments, while serving as the data logger. Additionally, notes were taken on task success, path deviations, number and type of errors, and comments.

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

- As quickly as possible making as few errors and deviations as possible.
- Without assistance; administrators were allowed to give immaterial guidance and clarification on tasks, but not instructions on use.
- Without using a think aloud technique

For each task, the participants were given a written copy of the task. Task timing began once the administrator finished reading the question. The task time was stopped once the participant indicated they had successfully completed the task. Scoring is discussed below in Section 3.9.

Following the session, the administrator gave the participant the post-test questionnaire (e.g., the System Usability Scale, see Appendix 5), and thanked each individual for their participation.

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

TEST LOCATION

Clinical sessions conducted November 10th, 2018 – December 10th, 2018 took place at the same location. The other five Clinical Sessions conducted were remote sessions. For these remote testing sessions, the moderator and administrator were at their personal offices, and each participant was at his/her location. Five Clinical Sessions were conducted in a comfortable, climate-controlled area during the session.

The test facility included a quiet testing room with a table, computer for the participant, and a computer for the administrator. Only the participant and administrator were in the test room. To ensure that the environment was comfortable for users, noise levels were kept to a minimum with the ambient temperature within a normal range. All the safety instruction and evacuation procedures were valid, in place, and visible to the participants.

TEST ENVIRONMENT

PhyGeneSys 5.0 would be typically be used in a healthcare office or surgical facility. In this instance, the testing was conducted in a controlled environment at a local facility or using a remote testing procedure.

For the remote testing sessions, system data was not collected from participants. The participants used keyboard and mouse when interacting with the EHRUT.

Remote sessions were conducted via FastSupport Sessions. Participants were instructed to call into a call line and to log into the fast support meeting. Control of the administers computer was passed to the participant. For testing, the computer used a laptop running a Windows operating system. The participants used both a mouse and keyboard when interacting with the EHRUT.

PhyGeneSys EHR 5.0 used a 16:9 ratio screen with a 1080p resolution. The application was set up by the administrator according to the vendor's documentation describing the system set-up and preparation. The application itself was running on a Window 10 platform using a test database on a WAN connection. Technically, the system performance (i.e., response time) was representative to what actual users would experience in a field implementation. Additionally, participants were instructed not to change any of the default system settings (such as control of font size).

TEST FORMS AND TOOLS

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

1. Informed Consent
2. Moderator's Guide
3. Tasks
4. Post-test Questionnaire

Examples of these documents can be found in Appendices 1-4 respectively. The Moderator's Guide was devised to be able to capture required data.

The test administrator logged into the FastSupport session to observe the test session for half of the participants of the study.

PARTICIPANT INSTRUCTIONS

The administrator reads the following instructions aloud to each participant (also see the full moderator's guide in Appendix [2]):

> *Thank you for participating in this study. Your input is very important. Our session today will last about 60 minutes. During that time, you will use an instance of an electronic health record. I will ask you to complete a few tasks using this system and answer some questions. You should complete the tasks as quickly as possible making as few errors as possible. Please try to complete the tasks on your own following the instructions very closely. Please note that we are not testing you we are testing the system, therefore if you have difficulty all this means is that something needs to be improved in the system. I will be here in case you need specific help, but I am not able to instruct you or provide help in how to use the application.*
>
> *Overall, we are interested in how easy (or how difficult) this system is to use, what in it would be useful to you, and how we could improve it. I did not have any involvement in its creation, so please be honest with your opinions. All the information that you provide will be kept confidential and your name will not be*

associated with your comments at any time. Should you feel it necessary you are able to withdraw at any time during the testing.

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

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

Participants were then given 11 tasks to complete. Tasks are listed under the User Tasks in Appendix 5.

STUDY DESIGN

In order to determine the Efficiency and Effectiveness of the EHRUT and Provider satisfaction with the platform, the study collected participant data in specific metrics. Data from each of these metrics may serve as a baseline for usability to inform and improve future tests with updated versions of the PhyGeneSys software.

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 it also to identify areas where improvements must be made.

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

- Number of tasks successfully completed within the allotted time without assistance

- Time to complete the tasks

- Number and types of errors

- Path deviations

- Participant's verbalizations (comments)

- Participant's satisfaction ratings of the system

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

1. Effectiveness of PhyGeneSys EHR 5.0 by measuring participant success rates and errors
2. Efficiency of PhyGeneSys EHR 5.0 by measuring the average task time and path deviations
3. Satisfaction with PhyGeneSys EHR 5.0 by measuring ease of use ratings

Tasks

Tasks (a)(1)-(9), (a)(14), and (b)(2) from the 45 CFR 170.315(g)(3) recommended task list were embedded into a series of scenarios representative of typical encounters for clinical Providers. The tasks comprise a set of activities a PhyGeneSys user could complete in clinic with a patient.

Tasks/Scenarios

§170.315(a)(1) Computerized provider order entry – Medications

• Scenario a.1.1: Record medication via CPOE

• Scenario a.1.2: Change medication via CPOE

• Scenario a.1.3: Display changed CPOE medication order

§170.315(a)(2) Computerized provider order entry – Laboratory

• Scenario a.2.1: Record lab orders via CPOE

• Scenario a.2.2: Change lab orders via CPOE

• Scenario a.2.3: Access CPOE lab orders

§170.315(a)(3) Computerized provider order entry – Diagnostic Imaging

• Scenario a.3.1: Record imaging orders via CPOE

• Scenario a.3.2: Change imaging orders via CPOW

• Scenario a.3.3: Access CPOE imaging orders

§170.315(a)(4) – Drug-drug, drug-allergy interaction check

• Scenario a.4.1: Trigger drug-drug interaction by entering new medication order

• Scenario a.4.2: Trigger drug-allergy interaction by entering new medication order

§170.315(a)(5) – Demographics

• Scenario a.5.1: Record preferred language, DOB, birth sex, race, ethnicity, sexual orientation, gender identity

• Scenario a.5.2: Change preferred language, DOB, birth sex, race, ethnicity, sexual orientation, gender identity

• Scenario a.5.3: Access preferred language, DOB, birth sex, race, ethnicity, sexual orientation, gender identity

§170.315(a)(6) – Problem List

• Scenario a.6.1: Record a problem to the problem list

• Scenario a.6.2: Change a problem on the problem list

• Scenario a.6.3: Access and display the active problem list

§170.315(a)(7) – Medication List

• Scenario a.7.1: Record a medication to the medication list

• Scenario a.7.2: Change a medication on the medication list

• Scenario a.7.3: Access and display the active medication list

§170.315(a)(8) – Medication Allergy List

• Scenario a.8.1: Record a medication allergy on the medication allergy list

• Scenario a.8.2: Change a medication allergy on the medication allergy list

• Scenario a.8.3: Access and display the active medication allergy list

§170.315(a)(9) – Clinical Decision Support

• Scenario a.9.1: Trigger a CDS intervention from the problem list

• Scenario a.9.2: Trigger a CDS intervention by adding a problem to the problem list

• Scenario a.9.3: Trigger a CDS intervention from the medication list

• Scenario a.9.4: Trigger a CDS intervention by adding to the medication list

• Scenario a.9.5: Trigger a CDS intervention using demographics

• Scenario a.9.6: Trigger a CDS intervention using a combination of demographics

§170.315(a)(14) – Implantable Device List

• Scenario a.14.1: Check the details of a historical entry on the Implantable Device list

• Scenario a.14.2: Update the information in a patient's Implantable Device list

• Scenario a.14.3: Add a device to the chart using information provided by the patient

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

• Scenario b.1: Incorporate a CCDA and conduct reconciliation of the medications, medication allergies, and problems in the CCDA with the information currently in the patient's record

• Scenario b.2: Generate a new CCDA with reconciled data

DATA SCORING

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

Measures	Rationale and Scoring
Effectiveness: Task Success	A task was counted as a "Success" if the participant was able to achieve the correct outcome, without assistance, within the time allotted on a per task basis. The total number of successes were calculated for each task and then divided by the total number of times that task was attempted. The results are provided as a percentage. Task times were recorded for successes. Observed task times divided by the optimal time for each task is a measure of optimal efficiency. Optimal task performance time, as benchmarked by expert performance under realistic conditions, is recorded when constructing tasks. Target task times used for task times in the Moderator's Guide must be operationally defined by taking multiple measures of optimal performance and multiplying by some factor [e.g., 1.25] that allows some time buffer because the participants are presumably not trained to expert performance. Thus, if expert, optimal performance on a task was [x] seconds then allotted task time performance was [x * 1.25] seconds. This ratio 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 an "Failures." 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.11 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 Deviation	The participant's path (i.e., steps) through the application was recorded. Deviations occur if the participant, for example, went to a wrong screen, clicked on an incorrect menu item, followed an incorrect link, or interacted incorrectly with an on-screen control. This path was compared to the optimal path. The number of steps in the observed path is divided by the number of optimal steps to provide a ratio of path deviation. It is strongly recommended that task deviations be reported. Optimal paths (i.e., procedural steps) should be recorded when constructing tasks.
Efficiency: Task Time	Each task was timed from when the administrator said "Begin" until the participant said, "Done." If he or she failed to say "Done," the time was stopped when the participant stopped performing the task. Only task times for tasks that were successfully completed were included in the average task time analysis. Average time per task was calculated for each task. Variance measures (standard deviation and standard error) were also calculated.

Satisfaction: Task Rating	Participant's subjective impression of the ease of use of the application was measured by administering both a simple post-task question as well as a post-session questionnaire. After each task, the participant was asked to rate "Overall, this task was:" on a scale of 1 (Very Difficult) to 5 (Very Easy). These data are averaged across participants. Common convention is that average ratings for systems judged easy to use should be 3.3 or above. To measure participants' confidence in and likeability of the PhyGeneSys EHR 5.0 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 Score questionnaire in Appendix 5.

RESULTS

DATA ANALYSIS AND REPORTING

The results of the usability test were calculated according to the methods specified in the 2.2.1 Usability Metrics section above. Participants who failed to follow session and task instructions had their data excluded from the analyses. No data exclusions or issues were noted.

The usability testing results for the EHRUT are detailed below (see Tables in 3.2). The results should be seen considering the objectives and goals outlined in Section 2.2 Study Design. The data should yield actionable results that, if corrected, yield material, positive impact on user performance.

The results from the SUS (System Usability Scale) scored the subjective satisfaction with the system based on performance with these tasks to be: 89.5. Broadly interpreted, scores under 60 represent systems with poor usability; scores over 80 would be considered above average.

POST TEST ANALYSIS

As predicted in our initial ranking of SED Tasks according to Risk, we found that the test results confirmed a good amount our suspicions. The Reconciliation of Clinical Information did have the longest time and caused the majority of participant remarks. Most voiced that they felt the most uneased during this task. Additionally, we confirmed that Adding Medications and Medication Allergies also posed a good amount of risk based on recorded data and participant remarks. Below is our ranking prioritized with the risk associated based on the analysis of our recorded data:

1. **Reconciling specific clinical information (Medications, Problems, Allergies) based on the information provided**
2. **Ordering Medications for a Patient & Verifying Drug-Drug, and Drug-Allergy Interactions**
3. **Adding Medications to the Medication list**
4. **Adding Medication Allergies to the Allergy list**

Participants did not complain of difficulty finding information on the screen, they loved the Overview Report and its ease of use to navigate to different sections of the chart. We did identify the Clinical Information Reconciliation process as one that is prone for errors. We will discuss internally how we can make that process more intuitive. Until that time, we believe this task could be potential for occurrence of an error with many potential adverse consequences from that error, i.e. Patient Safety. If we are seeing confusion with the clinicians when reconciling information, the potential for errors with Medication Ordering or Potential Drug-Drug/Drug-Allergy Interactiosn will be influenced greatly. With those potential errors comes a increased risk of Patient Safety. With the incorrect medications being ordered and no warnings going off, we could see adverse reactions, complications and basic contraindications with medications that the patient may have been prescribed. The Patient Safety risk that this is unacceptable and changes to the process need to be discussed.

DISCUSSION OF THE FINDINGS

Overall, the participants performed very well and were satisfied with PhyGeneSys 5.0. Participants shared that they felt that the solution had a very good flow and was very easy and useful. There were a few participants that had trouble with some parts of a few tasks (took longer time to complete than others) but overall that seemed to

be in relation to the participants overall comfortability with EHR systems. In general, all of the participants were able to successfully complete the tasks with little or no difficulty. Participants performed all tasks on their own with no assistance. The average performance rate and overall participant satisfaction rates were high. PhyGeneSys 5.0 system after careful consideration and design, appears to be an intuitive and user friendly EHR. Below are the individual criteria test findings.

3.2.1 170.315(a)(1) CPOE – Medications

Measure / Task	N	Effectiveness — Task Success		Efficiency — Path Deviation # of Steps		Efficiency — Task Time (Seconds)			Effectiveness — Errors		Satisfaction — Task Ratings
	#	Mean (%)	SD	Optimal	Observed (Mean)	Opt.	Mean	SD	Mean	SD	5=Easy
CPOE Medications											
Scenario a.1.1: Record a medication order via CPOE	10	100	0	8	8	36	42.5	2.9	0	0	4.6
Scenario a.1.2: Change medication via CPOE	10	100	0	10	10	17	22.6	4.9	0	0	4.6
Scenario a.1.3: Display Changed CPOE Medication Order	10	100	0	1	1	5	5.4	0.5	0	0	5

For CPOE Medications, our participants engaged in the following tasks:

1) Record medication via CPOE

2) Change medication via CPOE

3) Display changed CPOE medication order

EFFICIENCY

Scenario a.1.1 took an average of 42.5 seconds to complete, while Scenario a.1.2 took 22.6 seconds. No extra steps were required for Scenario a.1.2. Scenario a.1.3 took 5.4 seconds, on average, due to the bundling of both the save and the display features within the clinical documentation architecture for medication orders.

EFFECTIVENESS

Scenarios a.1.1, a1.2, and a1.3 were all completed with perfect 100 percent binary and partial task completion rates.

SATISFACTION

Scenarios a.1.1 and a.1.2 were rated as Somewhat Easy with a score of 4.6, while Scenario a.1.3 was rated as Very Easy with a score of 5.

MAJOR FINDINGS

All three scenarios were performed with perfect completion rates. The major discrepancies in completion times occurred between participants who elected to use the common order button to automatically populate the dose, frequency, duration, and quantity blanks on the order form and those who did not. The majority of unnecessary

and extra steps were the result of one or more of these blanks left incomplete, which triggered an error message through the platform that prompted participants to correct any errors.

AREAS OF IMPROVEMENT

The effectiveness and efficiency metrics indicate high usability for Scenarios 1.1, a.1.2, and a.1.3. Variations in task time and Ease of Task Completion Rating indicate the following areas for improvement:

- Improvements in the robustness of the common order prescription button to increase provider confidence in its accuracy will dramatically reduce documentation times as well as incurrence of error messages
- Expanding the preloaded list of synonyms for frequency of medication use would improve documentation efficiency for medication orders (e.g., if 2x autocorrected to BID)

3.2.2 170.315(a)(2) CPOE – Laboratory

Measure / Task	N	Effectiveness Task Success		Efficiency Path Deviation # of Steps		Task Time (Seconds)			Effectiveness Errors		Satisfaction Task Ratings
	#	Mean (%)	SD	Optimal	Observed (Mean)	Opt.	Mean	SD	Mean	SD	5=Easy
CPOE Laboratory											
Scenario a.3.1: Record Imaging order via CPOE	10	100	0	8	8	30	31.9	1	0	0	4.6
Scenario a.3.2: Change Imaging order via CPOE	10	100	0	5	5	8	8.3	0.5	0	0	4.6
Scenario a.3.3: Display changed CPOE Imaging Order	10	100	0	1	1	2	2	0	0	0	5

1) Record Lab Order via CPOE

2) Change Lab Order via CPOE

3) Display Changed CPOE Lab Order

EFFICIENCY

The average task times for Scenarios a.3.1 and a.3.2 were 31.9 seconds and 8.3 seconds, respectively. Scenario a.3.3 took an average of 2.0 seconds to complete due to bundling of the save and display features on lab orders. As a result, the extra steps statistic was negligible across all participants for Scenario a.3.

EFFECTIVENESS

All ten participants were successfully able to complete Scenarios 4, 5, and 6, with 100 percent binary and partial task completion rates. Additionally, seven out of ten participants completed the scenarios with no unnecessary steps.
The most common unnecessary step was failing to select which laboratory would conduct the test BEFORE indicating the preferred type of test. In this case, participants who selected the test type first found that the "Preferred Test" blank cleared upon selecting the laboratory.

SATISFACTION

Scenarios a.3.1, a.3.3, and a.3.3 were all rated as Very Easy to complete; Scenarios a.3.1 and a.3.2 scored at 4.6 while Scenario a.3.3 was rated at 5.

MAJOR FINDINGS

All three scenarios were performed with perfect completion rates. The depth of experience of all participants with this feature of the platform seemed to streamline the testing process. Very few questions were asked during this segment of the testing process. Additionally, moderators noted no negative remarks made during testing of these scenarios.

AREAS OF IMPROVEMENT

The only discernable area for improvement seemed to be allowing for greater flexibility with regards to the order in which sections of the lab order form are completed.

3.2.3 170.315(a)(3) CPOE – Diagnostic Imaging (Radiology)

Measure / Task	N	Effectiveness Task Success		Efficiency Path Deviation # of Steps		Efficiency Task Time (Seconds)			Effectiveness Errors		Satisfaction Task Ratings
	#	Mean (%)	SD	Optimal	Observed (Mean)	Opt.	Mean	SD	Mean	SD	5=Easy
CPOE Radiology											
Scenario a.2.1: Record Lab order via CPOE	10	100	0	6	6	35	32.4	1.6	0	0	4.7
Scenario a.2.2: Change Lab order via CPOE	10	100	0	6	6	8	8.4	0.5	0	0	4.7
Scenario a.2.3: Display changed CPOE Lab Order	10	100	0	1	1	3	2.3	0.5	0	0	5

    1) **Record Imaging Order via CPOE**

    2) **Change Imaging Order via CPOE**

    3) **Display changed CPOE Imaging Order**

EFFICIENCY

Participants completed Scenarios a.2.1 and a.2.2 in an average of 32.4 and 8.4 seconds, respectively, while eight out of ten participants finished with no extra steps. Scenario a.2.3 took an average of 2.3 seconds with negligible extra steps, again due to the bundling of the save and display features within the CDA for imaging orders.

EFFECTIVENESS

Perfect 100 percent binary and partial task completion rates were attained for each of the three

(3) scenarios, while only two participants took unnecessary steps throughout the testing process. These unnecessary steps were generally a result of an accidental erroneous selection of an imaging order from the drop-down list.

SATISFACTION

The majority of participants rated the scenarios as Very Easy. The average Ease of Task Completion Rating for Scenarios a.2.1 and a.2.2 was 4.7 and, for Scenario a.2.3, was 5. These ratings indicate a consistent level of satisfaction among all participants across each of the three (3) scenarios.

MAJOR FINDINGS

Efficiency, effectiveness, and satisfaction metrics are all high. The only documentation errors occurred when participants accidentally selected the wrong imaging order from the list. These errors were immediately corrected and would have had no impact on patient care.

AREAS OF IMPROVEMENT

Due to the consistency of errors made during this section of the testing process, the primary recommended area for improvement is the drop-down list of imaging order types. A list segmented by headings referring to body-part would likely make easier the selection of the proper imaging order which would streamline documentation workflows.

3.2.4 170.315(a)(4) Drug-Drug, Drug-Allergy Interaction Checks

Measure / Task	N	Effectiveness		Efficiency					Effectiveness		Satisfaction
		Task Success		Path Deviation # of Steps		Task Time (Seconds)			Errors		Task Ratings
	#	Mean (%)	SD	Optimal	Observed (Mean)	Opt.	Mean	SD	Mean	SD	5=Easy
Drug-Drug, Drug-Allergy Interaction Checks											
Scenario a.4.1: Using CPOE, trigger a drug-drug interaction by adding a new medication order	10	100	0	8	8.5	36	39.1	1.5	0	0	4.3
Scenario a.4.2: Using CPOE, trigger a drug-allergy interaction by entering a new medication order	10	100	0	7	7.5	36	39.3	2.6	0	0	4.3
Scenario a.4.3: Adjust the severity level of a displayed drug-drug interaction	10	100	0	6	6.5	17	17.3	0.9	0	0	4.4

1) Using CPOE, trigger a drug-drug interaction by entering a new medication order

2) Using CPOE, trigger a drug-allergy interaction by entering a new medication order

3) Adjust the severity level of a displayed drug-drug interaction

EFFICIENCY

The average task times for Scenario a.4.1 and a.4.2 were 39.1 seconds and 39.3 seconds, respectively. Scenario a.4.3 was completed with no extra steps by any of the participants

EFFECTIVENESS

All ten participants were able to successfully complete Scenarios a.4.2 and a.4.3, resulting in perfect binary and partial task completion rates. The relatively high average unnecessary steps value for Scenario a.4.2 resulted from mistakes made in manual entry of medication information. These errors can be mitigated by using the common order button to automatically populate the order.

SATISFACTION

Participants gave each scenario an Ease of Task Rating of 4.3, on average, indicating that the tasks were Somewhat Easy to complete.

MAJOR FINDINGS

Short average task times and low average extra and unnecessary step occurrence indicate high usability of the software for this task. Participants who chose to make use of the common order medication button were more successful in task completion and generally rated the task easier to complete.

AREAS OF IMPROVEMENT

Overall, participants made relatively few negative comments regarding usability of the clinical documentation interface for drug-drug, drug-allergy interaction checks. The extra steps and lower Ease of Task Completion Rating were primarily the result of an asymmetry of information between participant and moderator as to when each scenario could be considered complete.

Participants were understandably hesitant to save and approve a new medication order that triggered an interaction, even though this step was necessary for task completion in the eyes of the moderator and potential interactions are viewable by the user prior to final submission.

3.2.5 170.315(a)(5) Demographics

Measure / Task	N	Effectiveness Task Success		Efficiency Path Deviation # of Steps		Efficiency Task Time (Seconds)			Effectiveness Errors		Satisfaction Task Ratings
	#	Mean (%)	SD	Optimal	Observed (Mean)	Opt.	Mean	SD	Mean	SD	5=Easy
Demographics											
Scenario a.5.1: Record a patient's preferred language, date of birth, birth sex, race, ethnicity, 95sexual o11rientation, and gender identity	10	100	0	9	9	30	31	0.8	0	0	4.8
Scenario a5.2: Change the patient's preferred language, date of	10	100	0	9	9	25	25.7	0.7	0	0	4.8

birth, birth sex, race, ethnicity, sexual orientation, 1and gender identity											
Scenario a.5.3: Display the patient's changed preferred language, date of birth, birth sex, race, ethnicity, sexual orientation and gender identity	10	100	0	1	1	5	5.2	0.4	0	0	5

1) Record a patient's preferred language, date of birth, birth sex, race, ethnicity, sexual orientation, and gender identity

2) Change the patient's preferred language, date of birth, birth sex, race, ethnicity, sexual orientation, and gender identity

3) Display the patient's changed preferred language, date of birth, birth sex, ethnicity, sexual orientation, and gender identity

EFFICIENCY

Participants completed Scenario a.5.1 in an average of 31 second. Scenario a.5.2 was completed in an average of 25.7 seconds. Accessing demographics data was, by far, the simplest scenario of the three, taking just 5.2 seconds with negligible extra steps. Scenarios a.5.1 and a.5.2 required substantial manual input of information and both took over a minute and a half to complete.

EFFECTIVENESS

All three scenarios were completed fully, resulting in 100 percent binary and partial task completion rates.

SATISFACTION

Participants rated scenarios a.5.2 and a.5.3 as Very Easy 4.8 while Scenario a.5.4 received a perfect Ease of Task Completion Rating (5.0). This indicates consistent, high ease of task completion across scenarios in the Demographics category.

MAJOR FINDINGS

Participants recorded and updated demographics data with consistently high efficiency, effectiveness, and satisfaction. One of the only issues incurred was unfamiliarity with some of the terminology regarding gender identity.

AREAS OF IMPROVEMENT

Participants, overall, were reportedly very comfortable manually entering demographics information. The only areas for improvement gleaned from participant debrief are as follows:

- The documentation architecture for DOB requires that providers input month and year before inputting the day. If participants elect to enter the day of the month first, the year will reset which may result in erroneous documentation.

- Patients' home addresses needed to be verified in order to save demographic information which made documentation slightly more cumbersome.

3.2.6 170.315(a)(6) Problem List

Measure / Task	N	Effectiveness Task Success		Efficiency Path Deviation # of Steps		Task Time (Seconds)			Effectiveness Errors		Satisfaction Task Ratings
	#	Mean (%)	SD	Optimal	Observed (Mean)	Opt.	Mean	SD	Mean	SD	5=Easy
Problem List											
Scenario a6.1: Record a problem to the problem list	10	100	0	7	7	37	40	1.6	0	0	5
Scenario a.6.2: Change a problem on the problem list	10	100	0	3	3	5	6.1	0.6	0	0	5
Scenario a.6.3: Display the active problem list	10	100	0	1	1	6	5.8	0.6	0	0	5
Scenario a.6.4: Display the historical problem list	10	100	0	1	1	2	2	0	0	0	5

1) Record a problem to the problem list

2) Change a problem on the problem list

3) Display the active problem list

4) Display the historical medication list

EFFICIENCY

Participants completed Scenarios a.6.1 and a.6.2 in an average of 40 seconds and 6.1 seconds, respectively. Scenario a.6.3 took 5.8 seconds and Scenario a.6.4 took 0 seconds to display as the Active and Historical Problems are displayed on the same screen.

EFFECTIVENESS

Binary and partial task completion for all three scenarios was a perfect 100 percent.

SATISFACTION

Participants rated scenarios a.6.1 through a.6.4 as Very Easy with a rating score of 5. This indicates consistent, high ease of task completion across scenarios in the problem list category.

MAJOR FINDINGS

Once participants entered one problem on the problem list, it became quite clear and easy for them to replicate that. Additionally the modifications to the problem list was very easy for the participants.

AREAS OF IMPROVEMENT

Overall, the majority of participants performed Scenarios a.6.1, a.6.2, a.6.3, and a.6.4 with high degrees of efficiency, effectiveness, and satisfaction. Participant debrief identified no areas for improvement with the clinical documentation architecture for adding and changing problems in the problem list.

3.2.7 170.315(a)(7) Medication List

Measure / Task	N	Effectiveness Task Success		Efficiency Path Deviation # of Steps		Efficiency Task Time (Seconds)			Effectiveness Errors		Satisfaction Task Ratings
	#	Mean (%)	SD	Optimal	Observed (Mean)	Opt.	Mean	SD	Mean	SD	5=Easy
Medications List											
Scenario a.7.1: Record a medication to the medication list	10	100	0	8	8.3	36	40.7	1.7	0	0	4.2
Scenario a.7.2: Change a medication on the medication list	10	100	0	10	10.4	18	19.2	1	0	0	4.2
Scenario a.7.3: Display the active medication list	10	100	0	1	1	5	8.6	0.7	0	0	5
Scenario a.7.4: Display the historical medication list	10	100	0	1	1	2	2	0	0	0	5

1) **Record a medication to the medication list**

2) **Change a medication on the medication list**

3) **Display the active medication list**

4) **Display the historical medication list**

EFFICIENCY

Participants completed Scenarios a.7.1 and a.7.2 in 40.7 seconds and 19.2 seconds, respectively, with minimal extra steps.

EFFECTIVENESS

All medication list scenarios were completed successfully (100 percent binary and partial task completion rate).

SATISFACTION

Participants rated Scenarios a.7.1 and a.7.2 as Very Easy 4.2 while Scenario a.7.3 received an even higher Ease of Task Completion Rating 5. This indicates consistent, high ease of task completion across scenarios in the medication list category.

MAJOR FINDINGS

Utilization of the commonly placed medication orders was a nice feature that the participants liked and utilized.

AREAS OF IMPROVEMENT

Overall, the majority of participants performed Scenarios a.7.1, a.7.2, and a.7.3 with high degrees of efficiency, effectiveness, and satisfaction. However, providers should be trained and encouraged to use the closest defined path method of changing a medication to historical in order to decrease documentation time and extra steps.

3.2.8 170.315(a)(8) Medication Allergy List

Measure / Task	N	Effectiveness Task Success		Efficiency Path Deviation # of Steps		Efficiency Task Time (Seconds)			Effectiveness Errors		Satisfaction Task Ratings
	#	Mean (%)	SD	Optimal	Observed (Mean)	Opt.	Mean	SD	Mean	SD	5=Easy
Medication Allergy List											
Scenario a.8.1: Record a medication allergy	10	100	0	7	7.2	70	73.7	3	0	0	4.2
Scenario a.8.2: Change a medication allergy	10	100	0	4	4.2	5	5.9	0.9	0	0	4.2
Scenario a.8.3: Display the active medication allergy list	10	100	0	1	1	8	8.3	0.5	0	0	5
Scenario a.8.4: Display the historical medication allergy list	10	100	0	1	1	2	2	0	0	0	5

   1) Record a medication allergy

   2) Change a medication allergy

   3) Display the active medication allergy list

   4) Display the historical medication allergy list

EFFICIENCY

Scenario a.8.1 was completed in an average of 73.7 seconds with 0.2 average of deviated steps. Scenarios a.8.2 and a.8.3 were completed in 5.9 seconds and 8.3 seconds, respectively with negligible extra steps.

EFFECTIVENESS

All scenarios were successfully completed. Participants made 0.2 unnecessary steps while completing Scenarios a.8.1 & a.8.2 and made a negligible number of unnecessary steps while completing Scenario 8.3.

SATISFACTION

Participants rated scenarios a.8.1 & a.8.2 as Very Easy4.2 while Scenario a.8.3 received an even higher Ease of Task Completion Rating 5. This indicates consistent, high ease of task completion across scenarios in the medication allergy list category.

MAJOR FINDINGS

Scenarios a.8.1, a.8.2, and a.8.3 were completed with relatively few extra or unnecessary steps. Generally, extra steps were taken when participants added a description of the allergic reaction in a dialogue box at the bottom of the form. This often occurred when the participant did not see the drop down for the specified reaction in the form..

AREAS OF IMPROVEMENT

Overall, the majority of participants performed Scenarios a.8.1, a.8.2, and a.8.3 with high degrees of efficiency, effectiveness, and satisfaction. An important improvement could be made by grouping more specific allergic reactions under a common umbrella reaction (i.e., list all of the specified rash reactions under the more general rash umbrella subcategory).

3.2.9 170.315(a)(9) Clinical Decision Support

Measure / Task	N	Effectiveness Task Success		Efficiency Path Deviation # of Steps		Efficiency Task Time (Seconds)			Effectiveness Errors		Satisfaction Task Ratings
	#	Mean (%)	SD	Optimal	Observed (Mean)	Opt.	Mean	SD	Mean	SD	5=Easy
Clinical Decision Support											
Scenario a.9.1: Add a CDS intervention and/or reference resource for each of the required elements(Problem list, Medication list, Medication Allergy list, at least one Demographic, Laboratory Test, Vital Signs, and a combination of at least 2 of the elements listed above	10	100	0	14	14.9	45	47.4	1.7	0	0	4.2
Scenario a.9.2: Trigger a CDS interventions/resources added using the applicable data elements from each of the required elements	10	100	0	7	8	25	26.7	1.6	0	0	4.2
Scenario a.9.3: View the intervention/resource information using the Inforbutton standard for data elements in the problem list, medication list, and demographics	10	100	0	2	2	16	19.1	0.7	0	0	5
Scenario a.9.4: Trigger the CDS interventions/resources based on data elements in the problem list, medication list, and medication allergy list by incorporating patient information from a transition of care/referral summary	10	100	0	18	18.8	135	147.4	5.5	0	0	5
Scenario a.9.5: Access the following attributes for one of the triggered CDS interventions/resources: bibliographic citation, developer, funding source, release/revision date	10	100	0	4	4	15	18.7	1.5	0	0	5

1) **Add a CDS intervention and/or reference resource for each of the required elements**

   Problem List

   Medication List

   Medication Allergy List

   At least one Demographic

   Laboratory Test

   Vital Signs

   A Combination of at least 2 of the elements listed above.

2) **Trigger a CDS intervention/resources added using the applicable data elements from each of the required elements**

3) **View the intervention/resource information using the InfoButton standard for data elements in the problem list, medication list, and demographics**

4) **Trigger the CDS interventions/resources based on data elements in the problem list, medication list, and medication allergy list by incorporating patient information from a transition of care/referral summary**

5) **Access the following attributes for one of the triggered CDS interventions/resources: bibliographic citation, developer, funding source, and release/revision date**

EFFICIENCY

Scenarios a.9.1, a.9.2, and a.9.3 were completed in an average of 47.4 seconds with 0.9 extra steps. Scenarios a.9.4 & a.9.5 were completed in an average of 147.4 seconds, with 0.8 extra steps. Scenario a.9.5 was completed in 18.7 seconds with no extra steps.

EFFECTIVENESS

All scenarios were successfully completed. Participants made 0.9 unnecessary steps performing Scenario a.9.1, 1 unnecessary steps performing Scenarios a.9.2, and Scenarios a.9.3, and a.9.4, made 0.8 unnecessary steps and no unnecessary steps performing Scenarios a.9.5.

SATISFACTION

Participants rated Scenarios a.9.1- a.9.5 as Very Easy 4.2.This indicates consistent, high ease of task completion across scenarios in the clinical decision support category.

MAJOR FINDINGS

Scenarios a.9.1- a.9.5 were completed with relatively few extra or unnecessary steps. Generally, extra steps occurred when participants neglected to ascribe an "Unknown" value to a change in medication or demographics. These extra steps did not impede provider workflow and do not significantly impact usability.

AREAS OF IMPROVEMENT

Overall, the majority of participants performed Scenarios a.9.1- a.9.5 with high degrees of efficiency, effectiveness, and satisfaction. No major obstacles to workflow or task completion were reported during testing.

3.2.10 170.315(a)(14) Implantable Device List

Measure / Task	N	Effectiveness Task Success		Efficiency Path Deviation # of Steps		Efficiency Task Time (Seconds)			Effectiveness Errors		Satisfaction Task Ratings
	#	Mean (%)	SD	Optimal	Observed (Mean)	Opt.	Mean	SD	Mean	SD	5=Easy
Implantable Device List											
Scenario a.14.1: Record UDI	10	100	0	6	6	46	49.9	2.2	0	0	5
Scenario a.14.2: Change UDI Status	10	100	0	4	4	5	5	0	0	0	5
Scenario a.14.3: Access UDI, device description, identifiers, and attributes	10	100	0	1	1	2	2	0	0	0	5

1) Record UDI

2) Change UDI Status

3) Access UDI, device description, identifiers and attributes

EFFICIENCY

Scenario a.14.1 was completed in an average of 49.9 seconds with no extra steps. Scenario a.14.2 took participants a.14.2   5 seconds to complete with no extra steps. Scenario a.14.3 was completed in an average of 2.0 seconds with no extra steps.

EFFECTIVENESS

Binary and partial task completion for all three scenarios was a perfect 100 percent. Scenario a.14.1, a.14.2, a.14.3 were completed with no unnecessary steps.

SATISFACTION

Participants rated scenarios a.14.1 and a.14.2 as Very Easy 4.5 and a.14.3 as Very Easy 4.6. This indicates consistent, high ease of task completion across scenarios in the implantable device list category.

MAJOR FINDINGS

Scenarios a.14.1, a.14.2, and a.14.3 were completed with relatively few extra or unnecessary steps. Generally, extra steps were taken when participants toggled back and forth between the descriptions of different devices.

AREAS OF IMPROVEMENT

Participants performed Scenarios a.14.1, a.14.2, and a.14.3 with high degrees of efficiency, effectiveness, and satisfaction. No improvements or system changes are recommended.

3.2.11 170.315(b)(2) Clinical Information Reconciliation and Incorporation

Measure Task	N	Effectiveness Task Success		Efficiency Path Deviation # of Steps		Task Time (Seconds)			Effectiveness Errors		Satisfaction Task Ratings
	#	Mean (%)	SD	Optimal	Observed (Mean)	Opt.	Mean	SD	Mean	SD	5=Easy
Clinical Information Reconciliation and Incorporation											
Scenario b.2.1: Incorporate a CCDA and conduct reconciliation of the medications, medication allergies, and problems in the CCDA with the information currently in the patient's record	10	100	0	22	22	280	306.3	11.4	0	0	4.5
Scenario b.2.2: Generate a new CCDA with reconciled data	10	100	0	5	5	60	65.2	3.2	0	0	4.6

1) **Incorporate a CCDA and conduct reconciliation of the medications, medication allergies, and problems in the CCDA with the information currently in the patient's record**

2) **Generate a new CCDA with reconciled data**

EFFICIENCY

Scenario b.2.1 was completed in an average of 306.6 seconds with no extra steps. Scenario b.2.2 took participants a.14.2. 60 seconds to complete with no extra steps.

EFFECTIVENESS

Binary and partial task completion for all three scenarios was a perfect 100 percent.

SATISFACTION

Participants rated Scenarios b.2.1 as Very Easy 4.5 and b.2.2 as Very Easy 4.6. This indicates consistent, high ease of task completion across scenarios in the implantable device list category.

MAJOR FINDINGS

Scenarios b.2.1 and b.2.2 were completed with no extra or unnecessary steps.

AREAS OF IMPROVEMENT

Participants performed Scenarios b.2.1 and b.2.2 with high degrees of efficiency, effectiveness, and satisfaction. No improvements or system changes are recommended.

RESULTS NARRATIVE DISCUSSION

All of the participants were able to complete the tasks that were presented to them. All of the tasks had a 100% success rate, mostly due to the new layout utilizing the Overview Report to navigate the system. All of the tasks were completed within the allotted time. The overall success rate was 100% with no errors and few deviations. All of the participants were very satisfied with the system. The average Task Rating was 4, and the System Usability Questionnaire Score was 89.5.

The participants were able to complete all of the tasks within the allotted time. Based on the findings, we are looking at ways to make the Clinical Information Reconciliation so that the workflow is more intuitive, and that the UI is more user friendly. A central location to view all orders was recommended and we are going to work to incorporate that aspect into PhyGeneSys.

APPENDICES

The following appendices include supplemental data for this usability test report. Following is a list of the appendices provided:

Appendix 1: SAMPLE RECRUITING SCREENER

The purpose of a screener to ensure that the participants selected represent the target user population as closely as possible. (Portions of this sample screener are taken from www.usability.gov/templates/index.html#Usability and adapted for use.)

Recruiting Script for Recruiting Firm

Hello, my name is_____, calling from *[Insert name of recruiting firm]*. We are recruiting individuals to participate in a usability study for an electronic health record. We would like to ask you a few questions to see if you qualify and if would like to participate. This should only take a few minutes of your time. This is strictly for research purposes. If you are interested and qualify for the study, you will be paid to participate. Can I ask you a few questions?

Customize this by dropping or adding questions so that it reflects your EHR's primary audience

1. [If not obvious] Are you male or female? [Recruit a mix of participants]

2. Have you participated in a focus group or usability test in the past *xx* months? [If yes, Terminate]

3. Do you, or does anyone in your home, work in marketing research, usability research, web design [...etc.]? [If yes, Terminate]

4. Do you, or does anyone in your home, have a commercial or research interest in an electronic health record software or consulting company? [If yes, Terminate]

5. Which of the following best describes your age? [23 to 39; 40 to 59; 60 - to 74; 75 and older] [Recruit Mix]

6. Which of the following best describes your race or ethnic group? [e.g., Caucasian, Asian, Black/African-American, Latino/a or Hispanic, etc.]

7. Do you require any assistive technologies to use a computer? [if so, please describe]

Professional Demographics *Customize this to reflect your EHR's primary audience*

8. What is your current position and title? (Must be healthcare provider)
   - ☐ RN: Specialty _____
   - ☐ Physician: Specialty_____
   - ☐ Resident: Specialty _____
   - ☐ Administrative Staff
   - ☐ Other [Terminate]

9. How long have you held this position?

10. Describe your work location (or affiliation) and environment? (Recruit according to the intended users of the application) [e.g., private practice, health system, government clinic, etc.]

11. Which of the following describes your highest level of education? [e.g., high school graduate/GED, some college, college graduate (RN, BSN), postgraduate (MD/PhD), other (explain)]

Computer Expertise *Customize this to reflect what you know about your EHR's audience*

12. Besides reading email, what professional activities do you do on the computer? [e.g., access EHR, research; reading news; shopping/banking; digital pictures; programming/word processing, etc.] [If no computer use at all, Terminate]

13. About how many hours per week do you spend on the computer? [Recruit according to the demographics of the intended users, e.g., 0 to 10, 11 to 25, 26+ hours per week]

14. What computer platform do you usually use? [e.g., Mac, Windows, etc.]

15. What Internet browser(s) do you usually use? [e.g., Firefox, IE, AOL, etc.]

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

17. How many years have you used an electronic health record?

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

19. How does your work environment patient records? [Recruit according to the demographics of the intended users]
    ☐ On paper
    ☐ Some paper, some electronic
    ☐ All electronic

Contact Information *If the person matches your qualifications, ask*

Those are all the questions I have for you. Your background matches the people we're looking for. [If you are paying participants or offering some form of compensation, mention] For your participation, you will be paid [amount].

Would you be able to participate on [date, time]? [If so collect contact information]

May I get your contact information?

- Name of participant:
- Address:
- City, State, Zip:
- Daytime phone number:
- Evening phone number:
- Alternate [cell] phone number:
- Email address:

Before your session starts, we will ask you to sign a release form allowing us to videotape your session. The videotape will only be used internally for further study if needed. Will you consent to be videotaped?

This study will take place at [location]. I will confirm your appointment a couple of days before your session and provide you with directions to our office. What time is the best time to reach you?

Appendix 2: PARTICIPANT DEMOGRAPHICS

The report should contain a breakdown of the key participant demographics. A representative list is

shown below.

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

Gender	
Men	[X]
Women	[X]
Total (participants)	[X]

Occupation/Role	
RN/BSN	[X]
Physician	[X]
Admin Staff	[X]
Total (participants)	[X]

Years of Experience	
Years experience	[X]
Facility Use of EHR	
All paper	[X]
Some paper, some electronic	[X]
All electronic	[X]
Total (participants)	[X]

As an appendix to the report, the full participant breakdown (de-identified) should be included.

Appendix 3: NON-DISCLOSURE AGREEMENT AND INFORMED CONSENT FORM

NON-DISCLOSURE AGREEMENT

THIS AGREEMENT is entered into as of _____, between _____ ("the Participant") and PHI Medical Office Solutions, located at 5405 Roberts, Shawnee, KS 66226.

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 PHI Medical Office Solutions, 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 PHI Medical Office Solutions and is being disclosed solely for the purposes of the Participant's participation in today's usability study. By signing this form, the Participant will not disclose this confidential information obtained today to anyone else or any other organizations.

Participant's Printed Name: _____

Signature: _____ Date: _____

Informed Consent

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

Agreement

I understand and agree that as a voluntary participant in the present study conducted by PHI Medical Office Solutions ("PHI"), I am free to withdraw consent or discontinue participation at any time. I understand and agree to participate in the study conducted by PHI.

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 PHI. 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.

Participant's Printed Name: _____

Signature: _____ Date: _____

Appendix 4: EXAMPLE MODERATOR'S GUIDE

Only three tasks are presented here for illustration.

EHRUT Usability Test
Moderator's Guide

Administrator _____

Data Logger _____

Date _____

Time _____

Participant # _____

Location _____

Prior to testing
- Confirm schedule with Participants
- Ensure EHRUT lab environment is running properly
- Ensure lab and data recording equipment is running properly

Prior to each participant:
- Reset application
- Start session recordings with *tool*

Prior to each task:
- Reset application to starting point for next task

After each participant:
- End session recordings with *tool*

After all testing:
- Back up all video and data files

Orientation 8 minutes

Thank you for participating in this study. Our session today will last approximately **60 minutes**. During that time, you will take a look at an electronic health record system.

I will ask you to complete a few tasks using this system and answer some questions. We are interested in how easy (or how difficult) this system is to use, what in it would be useful to you, and how we could improve it. 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. Do not do anything more than asked. If you get lost or have difficulty, I cannot answer help you with anything to do with the system itself. Please save your detailed comments until the end of a task or the end of the session when we can discuss freely.

The product you will be using today is a new Electronic Medical Record, PhyGeneSys 5.0 which is undergoing the final steps for 2015 Certification

All of the information that you provide will be kept confidential and your name will not be associated with your comments at any time.

Do you have any questions or concerns?

Moderator's Question Guide

Preliminary Questions (*5* minutes)

- What is your job title / appointment?
- How long have you been working in this role? What are some of your main responsibilities?
- Tell me about your experience with electronic health records.

Appendix 5: User Tasks

Task 1: First Impressions (*XXX Seconds*)

- This is the application you will be working with. Have you heard of it? If so, tell me what you know about it.
- *Show test participant the EHRUT.*
- Please don't click on anything just yet. What do you notice? What are you able to do here? Please be specific.

Notes / Comments:

Task 2: CPOE Medications

- *Take the participant to the starting point for the task.*
- Record, Change, and Display Medications via CPOE

Success:

- **Easily completed**
- **Completed with difficulty or help - Describe below**
- **Not completed**

Comments:

Task Time: _____ Seconds

Optimal Path:

Click on the Green Icon next to Medication on the OverView Report → *Select New Rx* → *Select Tylenol Extra Strength 500 Oral Tablet* → *Select Save and Close* → *Click Mark as Complete and Save* → *Verify the Medication appears with the status of "Current"* → *Select Tylenol Extra Strength 500 mg Oral Tablet and click on the red icon to discontinue the medication selected* → *Verify the medication now displays as Discontinued* → *Next, click on the green icon again* → *Select Tylenol 325mg oral tablet and Click Save & Close* → *verify the medication appears on the medication list as current*

- **Correct**
- **Minor Deviations / Cycles - Describe below**
- **Major Deviations - Describe below**

Comments:

Observed Errors and Verbalizations:

Comments:

Rating:

    Overall, this task was: _____

    Show participant written scale: "Very Difficult" (1) to "Very Easy" (5)

Administrator / Notetaker Comments:

Task 3: CPOE Laboratory

- *Take the participant to the starting point for the task.*
- *Record, Change, and Display a Laboratory Order via CPOE*

Success:

- **Easily completed**
- **Completed with difficulty or help - Describe below**
- **Not completed**

Comments:

Task Time: _____ Seconds

Optimal Path:

Select Meds & Labs on the left side panel → Click on Labs → Select the Green Icon to place a new order → From the drop down, select a laboratory → From the lab test drop down, select UA – Urine Analysis → Set the Priority to Routine → Set the Date as today → Save and Close → Verify the lab displays in the chart under Active Lab Orders → Next, select the order and click on the Pencil Icon to modify the order → Change the Priority from Routine to STAT → Click Ok to save → Verify the order displays correctly in the chart

- **Correct**
- **Minor Deviations / Cycles - Describe below**
- **Major Deviations - Describe below**

Comments:

Observed Errors and Verbalizations:
Comments:

Rating:

      Overall, this task was: _____
      Show participant written scale: "Very Difficult" (1) to "Very Easy" (5)

Administrator / Notetaker Comments:

Task 4: CPOE Radiology

- *Take the participant to the starting point for the task.*
- **Record, Change and Display a Radiology Order via CPOE**

Success:

- **Easily completed**
- **Completed with difficulty or help - Describe below**
- **Not completed**

Comments:

Task Time: _____ Seconds

Optimal Path:

Select "Referrals" from the Left Side Panel → Select "Radiology" → Then Select "L-Spine" from the List and click on the Green Icon → Select "Shawnee XR" from the Radiology Center Drop Down → Select OK → Verify the Order appears in the Radiology Tab as Active → Right Click on the Order → Select Open → Chang eh Priority to Stat → Verify the priority is now listed as "Stat"

- **Correct**
- **Minor Deviations / Cycles - Describe below**
- **Major Deviations - Describe below**

Comments:

Observed Errors and Verbalizations:

Comments:

Rating:

Overall, this task was: _____

Show participant written scale: "Very Difficult" (1) to "Very Easy" (5)

Administrator / Notetaker Comments:

Task 5: Drug-Drug, Drug-Allergy Interaction Checks

- *Take the participant to the starting point for the task.*

- **Trigger a Drug-Drug Interaction, Trigger a Drug-Allergy Interaction and Change the Severity of a displayed Interaction**

Success:

- **Easily completed**

- **Completed with difficulty or help - Describe below**

- **Not completed**

Comments:

Task Time: _____ Seconds

Optimal Path:

Select the Green Icon in the Allergies Section of the Overview Report → Place a Medcition Order for Amoxicillin → Verify that a Drug-Alllergy Interaction is displayed → Cancel all Warnings → Place a Medication Order for Coumadin → Verify that a Drug-Drug Interaction is displayed → Cancel all warnings → Close the Patients Chart → Next, locate the Utilities section across the top → Select MD Tool Box → Select "Setup & Tools" → Select the Alert Setup from the Menu → Adjust the alerts for Drug-Drug and Drug-Allergy to "Only High" → Click "Save & Close"

- **Correct**

- **Minor Deviations / Cycles - Describe below**

- **Major Deviations - Describe below**

Comments:

Observed Errors and Verbalizations:

Comments:

Rating:

Overall, this task was: _____

Show participant written scale: "Very Difficult" (1) to "Very Easy" (5)

Administrator / Notetaker Comments:

Task 6: Demographics

- *Take the participant to the starting point for the task.*

- **Record, Change and Display a patients Language, DOB, Birth Sex, Race, Ethnicity, Sexual Orientation and Gender Identity**

Success:

- **Easily completed**

- **Completed with difficulty or help - Describe below**

- **Not completed**

Comments:

Task Time: _____ Seconds

Optimal Path:

Select the Person Icon across the top of the screen → Next, we are going to modify the Gender Identity, Birth Sex, Ethnicity and Race →Locate Gender Identity and select "Identifies as Male – 446151000124109 → Choose a Gender that corresponds to the Identity → Change the Ethnicity to "Hispanic / Latino – 2135-2 " → Select "Save and Close" → Again, Select the Person Icon and verify that the changes have been saved

- **Correct**

- **Minor Deviations / Cycles - Describe below**

- **Major Deviations - Describe below**

Comments:

Observed Errors and Verbalizations:

Comments:

Rating:

Overall, this task was: _____

Show participant written scale: "Very Difficult" (1) to "Very Easy" (5)

Administrator / Notetaker Comments:

Task 7: Problem List

- *Take the participant to the starting point for the task.*

- **Record, Change and Display Active / Historical Problems**

Success:

- **Easily completed**

- **Completed with difficulty or help - Describe below**

- **Not completed**

Comments:

Task Time: _____ Seconds

Optimal Path:

From the Overview Report, select the Green Icon next to "Active Problem List" → *Search for " Essential Hypertension I-10* → *Select Encounter for the Source* → *Chronic for Chronicity* → *Make the Status "Active"* → *Enter the Onset Date as 1yr ago today* → *Select "Save & Close"* → *Verify the Problem is not located on the Problem List as Active* → *Highlight the Problem and click on the Pencil Icon to make changes* → *Change the source to "History"* → *Select "Save & Close" Verify the information on the Problem List is displayed* → *Next, Select the Red Icon to Resolve the Problem* → *Chang the Status to Resolved* → *Select "Save & Close"*

- **Correct**

- **Minor Deviations / Cycles - Describe below**

- **Major Deviations - Describe below**

Comments:

Observed Errors and Verbalizations:

Comments:

Rating:

Overall, this task was: _____

Show participant written scale: "Very Difficult" (1) to "Very Easy" (5)

Administrator / Notetaker Comments:

Task 8: Medications List

- *Take the participant to the starting point for the task.*

- **Record, Change and Display Active/Historical Medication List**

Success:

- **Easily completed**

- **Completed with difficulty or help - Describe below**

- **Not completed**

Comments:

Task Time: _____ Seconds

Optimal Path:

Locate Medications on the OverView Report → Click on the Green Icon → Select New RX → Select Advil 200mg oral from the list → Enter Directions as "Take 1 Tablet as needed for Pain" → Dispense 10 → Select "Save & Close" → Verify the Medication is listed as "Active" on the Medication List → Now Highlight Advil 200mg from the Medication List → Click on the Red Icon to discontinue the medication → Verify the Medication now display under "Historical" → Again select the Green Icon → Search for Advil Allergy and Sinus Oral Tablet → Add "take 1 Tablet as needed for Pain" in the Signature Line → Select "Save & Close" → Verify the new medication appears on the Medication List as Current.

- **Correct**

- **Minor Deviations / Cycles - Describe below**

- **Major Deviations - Describe below**

Comments:

Observed Errors and Verbalizations:

Comments:

Rating:

Overall, this task was: _____

Show participant written scale: "Very Difficult" (1) to "Very Easy" (5)

Administrator / Notetaker Comments:

Task 9: Medication Allergy List

- *Take the participant to the starting point for the task.*

- **Record, Change and Display Active/Historical Medication Allergies**

Success:

- **Easily completed**

- **Completed with difficulty or help - Describe below**

- **Not completed**

Comments:

Task Time: _____ Seconds

Optimal Path:

In the Overview Report, Select the Green Icon for Allergies → Select penicillin G benzathine → Set the severity to Moderate → Status to "Active" → Reactions to Anaphylaxis → Mark the Onset as 1yr ago today → Click Save and Close → Do this once more for "Aspirin" → Repeat this for "Codeine" → Verify both allergies are listed → Highlight Penicillin G Benzathine from the list and click on the Pencil Icon to Modify → Chang the Reactions to "Hives" → Next Highlight "Codeine" from the list → Click on the Red Icon to Remove the Allergy to Historical → Verify that the allergy is now listed as Resolved/Removed

- **Correct**

- **Minor Deviations / Cycles - Describe below**

- **Major Deviations - Describe below**

Comments:

Observed Errors and Verbalizations:

Comments:

Rating:

Overall, this task was: _____

Show participant written scale: "Very Difficult" (1) to "Very Easy" (5)

Administrator / Notetaker Comments:

Task 10: Clinical Decision Support

- *Take the participant to the starting point for the task.*

- **Review the clinical recommendations from the CDS section of the chart**

Success:

- **Easily completed**

- **Completed with difficulty or help - Describe below**

- **Not completed**

Comments:

Task Time: _____ Seconds

Optimal Path:

Select Education → Click on "CDS" → Select the CDS interventions / resources from each of the required elements → View the Interventions information based on the data elements in the problem list, medication list and medication allergy list → Access the attributes for one of the CDS Interventions → Review the Bibliographic Citation → Developer → Funding Source → Release/Revision Date

- **Correct**

- **Minor Deviations / Cycles - Describe below**

- **Major Deviations - Describe below**

Comments:

Observed Errors and Verbalizations:

Comments:

Rating:

Overall, this task was: _____

Show participant written scale: "Very Difficult" (1) to "Very Easy" (5)

Administrator / Notetaker Comments:

Task 11: Implantable Device List

- *Take the participant to the starting point for the task.*

- **Please document a patient's implant**

Success:

- **Easily completed**

- **Completed with difficulty or help - Describe below**

- **Not completed**

Comments:

Task Time: _____ Seconds

Optimal Path:

Select Past History → Implants → Click on the Green Icon → Enter UDI # (01)00643169007222(17)160128(21)BLC200461H in the search field → Click on the Magnifying Glass to Search → Verify the UDI Information is now displayed → Now select the Pencil Icon to make changes to the Implant → Change the Device to In-Active → Select "Save & Close" → Verify the UDI is no longer active

- **Correct**

- **Minor Deviations / Cycles - Describe below**

- **Major Deviations - Describe below**

Comments:

Observed Errors and Verbalizations:

Comments:

Rating:

Overall, this task was: _____

Show participant written scale: "Very Difficult" (1) to "Very Easy" (5)

Administrator / Notetaker Comments:

Task 12: Clinical Information Reconciliation and Incorporation

- *Take the participant to the starting point for the task.*

- **Please import the file from your mail box and merge it to your patient's chart**

Success:

- **Easily completed**

- **Completed with difficulty or help - Describe below**

- **Not completed**

Comments:

Task Time: _____ Seconds

Optimal Path:

Select "Mail" at the top of the screen → Select the First Message in the List → Click on the attachment to import → Click "Create & Reconcile" → Accept all incoming Medications, Problems and Medication Allergies → Document these items as you have earlier in this testing → Select Close at the bottom of the screen

- **Correct**

- **Minor Deviations / Cycles - Describe below**

- **Major Deviations - Describe below**

Comments:

Observed Errors and Verbalizations:

Comments:

Rating:

Overall, this task was: _____

Show participant written scale: "Very Difficult" (1) to "Very Easy" (5)

Administrator / Notetaker Comments:

Appendix 5: SYSTEM USABILITY SCALE QUESTIONNAIRE

*In 1996, Brooke published a "*low-cost usability scale that can be used for global assessments of systems usability*" known as the System Usability Scale or SUS.*[16] *Lewis and Sauro (2009) and others have elaborated on the SUS over the years. Computation of the SUS score can be found in Brooke's paper, in at* http://www.usabilitynet.org/trump/documents/Suschapt.doc *or in Tullis and Albert (2008).*

	Strongly disagree				Strongly agree

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

| 1 | 2 | 3 | 4 | 5 |

2. I found the system unnecessarily complex

| 1 | 2 | 3 | 4 | 5 |

3. I thought the system was easy to use

| 1 | 2 | 3 | 4 | 5 |

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

| 1 | 2 | 3 | 4 | 5 |

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

| 1 | 2 | 3 | 4 | 5 |

[16] Brooke, J.: SUS: A "quick and dirty" usability scale. In: Jordan, P. W., Thomas, B., Weerdmeester, B. A., McClelland (eds.) *Usability Evaluation in Industry* pp. 189--194. Taylor & Francis, London, UK (1996). SUS is copyrighted to Digital Equipment Corporation, 1986.

Lewis, J R & Sauro, J. (2009) "The Factor Structure Of The System Usability Scale." in *Proceedings of the Human Computer Interaction International Conference (HCII 2009), San Diego CA, USA*

Final Questions (*X Minutes*)

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?

Administer the SUS