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## **EHR Usability Test Report of EyeDoc, Version 10.1**

EyeDoc, Version 10.1

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## Table of Contents

1. EXECUTIVE SUMMARY	3
Overall Ease of Use and Satisfaction of Tasks Performed During the Study	6
Major Findings	7
Areas for Improvement	7
2. INTRODUCTION	7
3. METHOD	8
3.1. Participants	8
3.2. Study Design	9
3.3. Tasks	10
3.4. Procedure	11
3.5. Test Location	12
3.6. Test Environment	12
3.7. Test Forms and Tools	12
3.8. Participant Instructions	13
3.9. Usability Metrics	14
3.10. Data Scoring	14
4. RESULTS	17
4.1. Data Analysis and Reporting	17
4.2. Discussion of the Findings	17
4.3. Major Findings	21
4.4. Areas for Improvement	21
5. APPENDICES	22
5.1. APPENDIX 1- PARTICIPANTS DEMOGRAPHICS	22
5.2. APPENDIX 2- INFORMED CONSENT FORM AND NON-DISCLOSURE AGREEMENT	24
5.3. APPENDIX 3- USABILITY INSTRUCTIONS	26
5.4. APPENDIX 4- SAFETY ENHANCED DESIGN TEST SCENARIOS	28
5.5. APPENDIX 5- POST TEST QUESTIONNAIRE	59



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## 1. EXECUTIVE SUMMARY

A usability test of EyeDoc Version 10.1, an ambulatory electronic health record software; was conducted from October 03, 2017 to October 06, 2017 from our office in India by Penn Medical employees. The purpose of this test was to test and validate the usability of the current user interface, and provide evidence of usability in the EyeDoc Software. During the usability test, 10 healthcare providers and/or other healthcare personnel matching the target demographic criteria, served as participants and used the EHR under test (EHRUT) in simulated, but representative tasks.

This study collected performance data on 43 tasks related to safety-enhanced design, typically conducted on an EHR.

§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 – Diagnostic Imaging

§170.315(a) (5) Demographics

§170.315(a) (6) Problem List

§170.315(a) (7) Medication 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 minutes, one-on-one usability test, each participant was greeted by the administrator and asked to review and sign an informed consent/NDA shown in Appendix 2. The participants were instructed that they could withdraw at any time. All participants were current users of EyeDoc, so they had prior experience with some version of the EHR. 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 elucidation or paraphrasing of instructions when the directions seemed uncertain.

The following types of data were collected for each participant:

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



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- Time to complete the tasks
- Number and types of errors
- Path deviations
- Participant’s verbalizations
- Participant’s satisfaction rating 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. 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 EyeDoc Version 10.1.

Following is a summary of the performance and rating data collected on EyeDoc Version 10.1.

<u>Task Identifier</u>	<u>Task Description</u>	<u>N</u>
		#
a.1.01	Record a CPOE medication order- Tab Timolol- 20mg OD for 1month RxNorm- 198285	10
a.1.02	Change a CPOE medication order- Tab Hydrochlorothiazide- 25mg OD FOR 1month RxNorm- 310798	10
a.1.03	Display changed CPOE medication order- Tab Hydrochlorothiazide- 25mg OD FOR 1month RxNorm- 310798	10
a.2.01	Record a CPOE lab order- CBC w/o Differential panel-Cord Blood, LOINC- 47288-6	10
a.2.02	Change a CPOE lab order- Change the order to cell count panel, LOINC- 34556-1	10
a.2.03	Display changed CPOE Lab order- cell count panel, LOINC- 34556-1	10
a.3.01	Record a CPOE image order- Photo documentation eye- Right (LOINC-29111-2)	10
a.3.02	Change the CPOE image order- Retinal digital photography (LOINC- 65898-9)	10
a.3.03	Display changed CPOE image order- Corneal Topography CPT- 92025	10



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a.5.01	Record demographics- Record Date of Birth, 06/02/1985  Record Sex, Female  Record Race, American Indian (OMB- 1002-5)  Record Ethnicity, Hispanic Latino (OMB- 2135-2)  Record Preferred Language, English  Record Sexual Orientation, Bisexual  Record Gender Identity, Male-to-Female (MTF)/Transgender	10
a.5.02	Change demographics- Change Date of Birth, 06/02/1984  Change Sex, Male  Change Race, White (OMB- 2106-3)  Change Ethnicity, Declined to specify  Change Preferred Language, Spanish  Change Sexual Orientation, Straight/Heterosexual  Change Gender Identity, Identifies as Male	10
a.5.03	Display the patient's changed preferred language, date of birth, birth sex, race, ethnicity, sexual orientation, gender identity	10
a.6.01	Record a problem to the problem list- SNOMED- 312904009 Moderate Non proliferative Diabetic Retinopathy	10
a.6.02	Change a problem on the problem list- RESOLVE internal hordeolum. ICD10- H00.021 SNOMED- 414521009	10
a.6.03	Display the active problem list- SNOMED- 312904009 Moderate Non proliferative Diabetic Retinopathy	10
a.6.04	Display the historical problem list- RESOLVE internal hordeolum. ICD10- H00.021 SNOMED- 414521009 SNOMED- 312904009 Moderate Non proliferative Diabetic Retinopathy	10
a.7.01	Record a medication to the medication list- Carbamazepine 100mg, Oral, Once daily for 15 days. RxNorm Code- 388399	10
a.7.02	Change a medication on the medication list- Discontinue Lisinopril 20mg one capsule by mouth once daily for 30 days. RxNorm 197884	10
a.7.03	Display the active medication list- Carbamazepine 100mg, Oral, Once daily for 15 days. RxNorm Code- 388399	10
a.7.04	Display the historical medication list- Carbamazepine 100mg, Oral, Once daily for 15 days. RxNorm Code- 388399  Discontinued Lisinopril 20mg one capsule by mouth once daily for 30 days. RxNorm 197884	10
a.8.01	Record a medication allergy Penicillin V; RxNorm code: 7984; Reaction: Dizziness	10
a.8.02	Change a medication allergy INACTIVE Codeine; RxNorm code: 2670; Reaction: Diarrhoea and Abdominal Pain	10

a.8.03	Display the active medication allergy list Penicillin V; RxNorm code: 7984; Reaction: Dizziness	10
a.8.04	Display the historical medication allergy list- Penicillin V; RxNorm code: 7984; Reaction: Dizziness  INACTIVE Codeine; RxNorm code: 2670; Reaction: Diarrhoea and Abdominal Pain	10
a.9.01	Add a CDS intervention and/or reference resource for each of the required elements- Problem list (SNOMED- 312904009 Moderate Non proliferative Diabetic Retinopathy) Medication list (RxNorm Code- 388399 Carbamazepine 100mg) Medication Allergy List (Penicillin G Potassium) At least one Demographic (Race- American Indian) Laboratory Test (LOINC- 47288-6 CBC w/o Differential panel-Cord Blood) Vital Signs (BP= >130 and >90) And a combination of at least 2 of the elements listed above (Demographics, Age= >20 years and Medication Allergy, Penicillin V; RxNorm code: 7984; Reaction: Dizziness)	10
a.9.02	Trigger the CDS interventions/resources added using the applicable data elements from each of the required elements. Go to the Vital Signs tab and enter Blood Pressure 140/95 mm/Hg	10
a.9.03	View the intervention/resource information using the Info button standard (HELP Tab) for data elements in the problem list, medication list, and demographics	10
a.9.04	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
a.9.05	Access the following attributes for one of the triggered CDS interventions/resources: bibliographic citation, developer, funding source, release/revision date	10
a.14.01	Record UDI- =/W4146EB0010T0475=,000025=A99971312345600=>014032=}013032&,1000000000000XYZ123	10
a.14.02	Change the status of the Unique Device Identifier (UDI)	10
a.14.03	Access UDI, device description, identifiers and attributes	10
b.2.01	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
b.2.02	Generate a new CCDA with reconciled data	10

## Overall Ease of Use and Satisfaction of Tasks Performed During the Study

### *Ease of Use*

- Overall the subjective ease of use mean was 3.17 out of 5.
- Overall the percentage of ease of use was 63.4.

### *Satisfaction*

- Overall the subjective satisfaction mean was 4.6 out of 5.
- Overall the percentage satisfaction of use was 92.



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## Major Findings

During the testing of EyeDoc Version 10.1 we found that the participants were comfortable with the tasks given and were able to perform the same with ease. Maximum time taken by participants was while configuring CDS alerts and while capturing the UDI for Implantable Device. At the same time, maximum deviation from the original steps was found in adding CPOE Medication.

Several participants seemed confused by the Gender Identity selection, because gender selection is still required.

In addition to the specific findings and areas for improvement in specific features, several overall areas for improvement recurred throughout this usability study. Low familiarity ratings with certain functionality, along with participants' lack of awareness of the existence of some functionality, may indicate a need for training and documentation that is accessible within common workflows and provided in formats that are easily consumable by busy clinical professionals.

Another recurring feedback from participants was that workflows could better streamlined and optimized. These comments were directed mostly at Implantable device workflows and CDS intervention workflows. This feedback identifies opportunities to make refinements to the user interface to reduce click-counts and enhance efficiency for clinicians.

## Areas for Improvement

- On Capturing Medications under Medication/ Testing tab > Medications > Details button, medication name should be reflected in the display grid.
- Filters to view Active/ Inactive/ Resolved Problem List to be added.
- Filters to view Active/ Inactive/ Resolved Medication List to be added.
- Filters to view Active/ Inactive/ Resolved Medication Allergy List to be added.
- While capturing the UDI number for an Implantable Device, provision to scan and capture the UDI number to be given. Search improvements, such as favorites or search suggestions, would improve the usability of this feature.
- Participants indicated that they would also like the ability to note implanted devices reported by the patient or referring provider, even when the device ID is not available.

## 2. INTRODUCTION



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The EHR under test for this study is EyeDoc Version 10.1, designed to present medical information to ophthalmologists in an ambulatory setting. EyeDoc Version 10.1 understands practice patterns and decision making processes of ophthalmologists, improves documentation and helps eliminate errors. Provides clinical templates for addressing common problems based on the primary complaint. EyeDoc provides components necessary for an intelligent search, produces automated consultation reports, prescriptions and patient handouts and implements comprehensive data entry system.

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 EyeDoc Version 10.1. To this end measures of effectiveness, efficiency and user satisfaction such as task time, deviations and success rate were captured during the usability testing.

### 3. METHOD

#### 3.1. Participants

A total of 10 participants were tested on EyeDoc Version 10.1. Participants in the test were health care providers and other health care personnel. Participants were recruited by Penn Medical Staff, and were not compensated for their time. In addition, participants did not have a direct connection to the development of or to the organization producing EyeDoc Version 10.1. 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, representing the cohort of intended users. The following is a table of participants by characteristics, including demographics, professional experience, and computer experience. Participant names were replaced with Participant IDs, so that individuals' data cannot be tied back to individual identities.

Part ID	Gender	Age	Education	Occupation/ role	Professional Experience	Computer Experience	Product Experience	Assistive Technology Needs
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ED01	Male	50-59	Bachelor's Degree	Sr. Director (IT)	276	276	168	NO
ED02	Female	20-29	Associate Degree	IT Support Technician	60	60	120	NO
ED03	Male	30-39	Bachelor's Degree	IT Technician Ophthal Dept.	84	264	24	NO
ED04	Female	30-39	Associate Degree	Technician	108	240	108	NO
ED05	Female	40-49	High School Graduate	IT Support Technician	360	300	156	NO
ED06	Female	30-39	High School Graduate	Optician	180	312	48	NO
ED07	Female	40-49	Associate Degree	Ophthal Technician	240	360	54	NO
ED08	Female	50-59	High School Graduate	Ophthalmic Assistant	360	156	144	NO
ED09	Female	60-69	Bachelor's Degree	Ophthalmic Assistant	468	180	156	NO
ED10	Female	20-29	Bachelor's Degree	Ophthalmic Assistant	36	180	12	NO

Ten participants matching the description of intended users were recruited, and all ten participated in the usability test. No participants failed to show up for the study.

Participants were scheduled for 1 session of 60 minute with time after the session for an overview by the administrator and data logger and to reset systems to proper test conditions. A spreadsheet was used to keep track of the participant schedule and included each participant's demographic characteristics.

### 3.2. Study Design

Overall, the objective of this test was to uncover areas where the application performed well – that is, effectively, efficiently, and with 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 EyeDoc. In



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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 EyeDoc Version 10.1. Each participant used the system in the same location, and was provided with the same instructions. The system was evaluated for effectiveness, efficiency and satisfaction as defined by measures collected and analyzed for each participant:

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

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

### 3.3. Tasks

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

- Computerized Physician Order Entry (Medication, Laboratory & Diagnostic imaging)
- Patient Demographic Changes
- Problem list
- Medication list
- Medication allergy list
- Clinical Decision Support (CDS)
- Implantable device list
- Clinical Information Reconciliation and Incorporation

These tasks were selected based on the twelve ONC CEHRT2015 certification criteria, considering frequency of use, potential for risk to patient safety, and criticality of function.

(See Appendix 4: Safety Enhanced Design Test Scenarios).

### 3.4. Procedure

Upon arrival, participants were greeted. Their identity was verified and matched to a name on the participant schedule. Participants were then assigned a participant ID. Each participant had already reviewed, signed and returned the informed consent and non-disclosure agreement shown in Appendix 2. A representative from the test team witnessed the participant's signature.

To ensure that the test ran smoothly, two staff members participated in this test—the usability administrator and the data logger. The usability testing staff members conducting the test were experienced usability practitioners.

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

Participants were instructed to perform the tasks:

- 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 for use without reductions in ratings.
- Without using a think aloud technique

The administrator read the tasks aloud to the participants and then instructed them to initiate performing the tasks. The participants had the written copies of just the tasks. Exact details of the procedures used and tasks performed are shown in Appendix 4. The task time was stopped once the participant indicated they had successfully completed the task. At the end of each task the participant rated the question on a scale of 1 – 5 with 5 being the easiest and 1 the most difficult.

Time was recorded from the declaration to begin until the participant either completed



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the task successfully or failed the task.

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.

### 3.5. Test Location

The test facility included a testing room with a table, computer for the participant, and recording computer for the administrator. The participant, the administrator and the data logger viewed the screen simultaneously.

To ensure that the environment was comfortable for users, noise levels were kept to a minimum with the ambient temperature within a normal range. All of the safety instruction and evacuation procedures were valid, in place, and visible to the participants.

### 3.6. Test Environment

The EyeDoc Software would typically be used in a healthcare office or facility. In this instance, the testing was conducted in Penn Medical's office. For testing, the computer used was Dell running Windows Server 2012 R2 using a testing database. The participants used the mouse and keyboard when interacting with EyeDoc Version 10.0.

EyeDoc can function on a variety of screen sizes and resolutions. In order to display well on all monitors, a resolution of 1920 x 1080 was used.

EyeDoc Version 10.1 was set up by the Penn Medical's in-house Information Technology staff members as it would be for a typical installation. It was connected to the Internet wired connection.

### 3.7. Test Forms and Tools



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Prior to the commencement of the test, the participants were provided with the informed consent and non-disclosure agreement shown in Appendix 2. All participants signed and returned the form. Also prior to the test, participants were given the rating metrics, so they would have them available during testing for reference. Rating metrics sent were:

- 1 – Very Difficult
- 2 – Difficult
- 3 – Neither Difficult nor Easy
- 4 – Easy
- 5 – Very Easy

Immediately following the test, participants were asked the questions on the post-test questionnaire shown in Appendix 5.

### 3.8. Participant Instructions

At the beginning of each testing session the administrator read the following instructions aloud to each participant:

Thank you for participating in this study. Your input is very important. Our session today will last about 60 minutes. During that time you will use an instance of an electronic health record, EyeDoc. 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. Please be honest with your opinions. All of the information that you provide will be kept confidential and your name will not be associated with your comments at any time. Should you feel it necessary, you are able to withdraw at any time during the testing.



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Further, following instructions were given to the participants:

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 you to not to talk aloud or verbalize while you are doing the tasks. I will ask for your impressions about the task once you are done.

Participants were then given 43 tasks to complete. Tasks are listed in Appendix 4.

### 3.9. Usability Metrics

According to the NIST Guide to the Processes Approach for Improving the Usability of Electronic Health Records, EHRs should support a process that provides a high level of usability for all users. The goal is for the 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:

- The effectiveness of EyeDoc Version 10.1, by measuring participant success rates and errors
- The efficiency of EyeDoc Version 10.1, by measuring the average task time and path deviations
- The satisfaction with EyeDoc Version 10.1, by measuring ease of use ratings

### 3.10. Data Scoring

The following table unveils the details of how tasks were scored, the errors were evaluated and the time data was analyzed-



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<u>Measures</u>	<u>Rationale and Scoring</u>
<p><u>Effectiveness:</u>            Task Success</p>	<p>Task success was determined by assigning numeric weights for various levels of task success, as follows:            Success (without assistance) denoted by 2 = 1.0            Partial success denoted by 1 = 0.5            Failure denoted by 0 = 0.0</p> <p>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.</p> <p>The total number of successes were calculated for each task and then divided by the total number of times that task was attempted. The results are provided as a percentage.</p> <p>Task times were recorded for successes. Observed task times divided by the optimal time for each task is a measure of optimal efficiency.</p> <p>Optimal task performance time, as benchmarked by expert performance under realistic conditions, is recorded when constructing tasks.</p>

<p><u>Effectiveness:</u> Task Failure</p>	<p>If the participant abandoned the task, did not reach the correct answer or performed it incorrectly, or reached the end of the allotted time before successful completion, the task was counted as a “Failures.” No task times were taken for errors.</p> <p>The total number of errors was calculated for each task and then divided by the total number of times that task was attempted.</p> <p>Not all deviations would be counted as errors. This should also be expressed as the mean number of failed tasks per participant.</p>
<p><u>Efficiency:</u> Task Deviations</p>	<p>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.</p> <p>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.</p> <p>It is strongly recommended that task deviations be reported.</p> <p>Optimal paths (i.e., procedural steps) should be recorded when constructing tasks.</p>
<p><u>Efficiency:</u> Task Time</p>	<p>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.</p> <p>Only task times for tasks that were successfully completed were included in the average task time analysis. Average time per task was calculated for each task. Variance measures (standard deviation and standard error) were also calculated.</p>
<p><u>Satisfaction:</u> Task Rating</p>	<p>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.</p>

	<p>To measure participants’ confidence in and likeability of the [EHRUT] 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.</p>
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## 4. RESULTS

### 4.1. Data Analysis and Reporting

The results of the usability test of specific safety –design related tasks were calculated according to the methods specified in the Usability Metrics section above.

The usability testing results for EyeDoc are detailed below. A numerical summary enclosing all the tasks covered is shown in a tabular form in the Executive Summary section of this report. The results should be seen in light of the objectives and goals outlined in the Study Design section. The data yielded actionable results that, when corrected, will yield a material, positive impact on user performance.

### 4.2. Discussion of the Findings

The test findings are discussed below:

#### **Clinical Decision Support (CDS)**

**Effectiveness:** The success score for the access and enable CDS interventions task was 90%, indicating that providers had more trouble adding the same. However, Providers could easily complete the Process and Locate reference information for a CDS intervention task, as evidenced by the success score of 97.5%.

**Efficiency:** All the participants completed the tasks with ease but took more time as suggested by the expert timings. Participants completed these tasks within the number of optimal steps recorded.

**Satisfaction:** Participants had an average satisfaction rating of 4.64 out of 5 on a Likert scale. Although few of the participants were unfamiliar with these tasks, still



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they found it easy to complete.

### **Problem List**

**Effectiveness:** All participants were able to successfully access the problem list and add a new problem, yielding task success scores of 100% for accessing the problem list and 95% for adding a new problem correspondingly. The task success score for changing a problem was 95%.

**Efficiency:** Majority of participants completed the tasks with either fewer steps or the same number of steps as expert users. Participants completed the tasks taking slightly more time than the optimal time for Recording Problem and Changing Problem task, as suggested by expert timings.

**Satisfaction:** Participants had an average satisfaction rating of 4.75 out of 5 points on a Likert scale. Most participants were familiar with these tasks and found them straightforward and easy to complete.

### **Medication List**

**Effectiveness:** The success scores for accessing the active medications list and full medications list tasks were 100%. Participants were easily able to access the medication list. The task to change an existing medication had a success score of 100% while the success score for recording a new medication was 85%.

**Efficiency:** All participants completed the tasks with either fewer steps or the same number of steps as expert users. Three out of Ten participants struggled to a record medication to the medication list.

**Satisfaction:** Participants had an average satisfaction rating of 4.82 out of 5 points on a Likert scale. Most participants were familiar with these tasks and found them very easy to complete.

### **CPOE Laboratory**

**Effectiveness:** The success scores for Recording a CPOE Laboratory order task was 95% while for changing a CPOE Laboratory order and for displaying the changed CPOE Laboratory order task was 100%.

**Efficiency:** Nine out of the ten participants completed all the tasks with ease while



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one had slight difficulty in recording CPOE Laboratory order. All the participants exceeded the number of optimal steps recorded for these tasks.

**Satisfaction:** Participants had an average satisfaction rating of 4.6 out of 5 points on a Likert scale. Most participants were familiar with these tasks and found them straightforward and easy to complete.

### **CPOE Imaging**

**Effectiveness:** The success score for each of these tasks was 100%. Participants were easily able to access CPOE imaging orders and record a new CPOE imaging order.

**Efficiency:** All participants completed the change CPOE imaging order and display changed CPOE imaging order task with the same number of steps as expert users. While they took slightly more steps to complete the record CPOE imaging order task.

**Satisfaction:** Participants had an average satisfaction rating of 4.5 out of 5 points on a Likert scale. Most participants were familiar with these tasks and found them straightforward and easy to complete.

### **CPOE Medication**

**Effectiveness:** The success scores for Recording a CPOE Medication order task was 80% while for changing a CPOE Medication order and for displaying the changed CPOE Medication order task was 100%.

**Efficiency:** Six out of the ten participants completed all the tasks with ease while four had slight difficulty in recording CPOE Medication order. All the participants completed these tasks within the number of optimal steps recorded.

**Satisfaction:** Participants had an average satisfaction rating of 4.4 out of 5 points on a Likert scale. Most participants were familiar with these tasks and found them straightforward and easy to complete.

### **Demographics**

**Effectiveness:** The success score for Change Demographics and Display the Changed demographics task was 100%. On the Record Demographics task, the success score was 95%.

**Efficiency:** Participants exceeded the target time for these tasks as compared to the



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optimal time recorded. All the participants exceeded the number of optimal steps while change the demographics.

**Satisfaction:** Participants had an average satisfaction rating of 4.7 out of 5 points on a Likert scale. Most participants were familiar with these tasks and found them straightforward and easy to complete.

### **Medication Allergy List**

**Effectiveness:** The success score for the access active medication allergy list, access full medication allergy list, and change medication allergy tasks was 100%. For recording a medication allergy task, the success score was 95%.

**Efficiency:** Most participants exceeded the optimal number of steps for recording the medication allergy task, and took more time than the optimal time in completing the same. While they performed the remaining tasks with ease.

**Satisfaction:** Participants had a rating of 4.8 out of 5 points on a Likert scale. Most participants were familiar with these tasks and found the workflows easy to complete.

### **Implantable Device List**

**Effectiveness:** The success score for each of these tasks was 100%. Participants were easily able to access, change, and record implantable devices.

**Efficiency:** All participants were able to complete the tasks taking more time than the optimal time for each task, as suggested by expert timings. On average, participants exceeded the optimal number of steps for the tasks due to unfamiliarity with this feature.

**Satisfaction:** Participants had an average satisfaction rating of 4.5 out of 5 points on a Likert scale. Although unfamiliar with these relatively new tasks, most participants found them easy to complete.

### **Clinical Information Reconciliation and Incorporation**

**Effectiveness:** The success score for each of these tasks was 95%.

**Efficiency:** Most of the participants exceeded that target time and optimal number of steps for these tasks. However, all participants were ultimately able to complete these tasks.



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**Satisfaction:** Participants had an average satisfaction rating of 3.9 out of 5 points on a Likert scale. Although unfamiliar with these tasks, most participants found them easy to complete.

#### 4.3. Major Findings

During the testing of EyeDoc Version 10.1 we found that the participants were comfortable with the tasks given and were able to perform the same with ease. Maximum time taken by participants was while configuring CDS alerts and while capturing the UDI for Implantable Device. At the same time, maximum deviation from the original steps was found in adding CPOE Medication.

Several participants seemed confused by the Gender Identity selection, because gender selection is still required.

In addition to the specific findings and areas for improvement in specific features, several overall areas for improvement recurred throughout this usability study. Low familiarity ratings with certain functionality, along with participants' lack of awareness of the existence of some functionality, may indicate a need for training and documentation that is accessible within common workflows and provided in formats that are easily consumable by busy clinical professionals.

Another recurring feedback from participants was that workflows could better streamlined and optimized. These comments were directed mostly at Implantable device workflows and CDS intervention workflows. This feedback identifies opportunities to make refinements to the user interface to reduce click-counts and enhance efficiency for clinicians.

#### 4.4. Areas for Improvement

- On Capturing Medications under Medication/ Testing tab > Medications > Details button, medication name should be reflected in the display grid.
- Filters to view Active/ Inactive/ Resolved Problem List to be added.
- Filters to view Active/ Inactive/ Resolved Medication List to be added.
- Filters to view Active/ Inactive/ Resolved Medication Allergy List to be added.
- While capturing the UDI number for an Implantable Device, provision to scan and capture the UDI number to be given. Search improvements, such as favorites or search suggestions, would improve the usability of this feature.



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- Participants indicated that they would also like the ability to note implanted devices reported by the patient or referring provider, even when the device ID is not available.

## 5. APPENDICES

### 5.1. APPENDIX 1- PARTICIPANTS DEMOGRAPHICS

Below is a summary of participant demographics for this study.

#### 1. Participant Gender

Participant Gender	n (N=10)	%
Male	2	20
Female	8	80
Total (Participants)	10	100

#### 2. Participant Age

Participant Age	n (N=10)	%
20-29	2	20
30-39	3	30
40-49	2	20
50-59	2	20
60-69	1	10
Total (Participants)	10	100

### 3. Participant Education

Participant Education	n (N=10)	%
Bachelor's Degree	4	40
Associate Degree	3	30
High School Graduate	3	30
Total (Participants)	10	100

### 4. Participant Roles

Participant Roles	n (N=10)	%
Sr. Director (IT)	1	10
IT Support Technician	2	20
IT technician Ophthal. Dept.	1	10
Technician	1	10
Optician	1	10
Ophthal. Technician	1	10
Ophthalmic Assistant	3	30
Total (Participants)	10	100

### 5. Participant Professional Experience (Mean – Months and Years)

Total Participants	Mean Professional Experience (Months)	Mean Professional Experience (Years)
10	217.2	18.1

### 6. Participant Computer Experience (Mean – Months and Years)

Total Participants	Mean Computer Experience (Months)	Mean Computer Experience (Years)



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10	232.8	19.4
----	-------	------

7. Participant Product Experience (Mean – Months and Years)

Total Participants	Mean Product Experience (Months)	Mean Product Experience (Years)
10	99	8.25

5.2. APPENDIX 2- INFORMED CONSENT FORM AND NON-DISCLOSURE AGREEMENT

INFORMED CONSENT

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

Agreement

I understand and agree that as a voluntary participant in the present study conducted by Penn Medical, I am free to withdraw consent or discontinue participation at any time.

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

I understand and agree that the data collected from this study may be shared outside of Penn Medical and EyeDoc clients. 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.



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NO, I choose not to participate in this study.

**Participant's printed name:**

\_\_\_\_\_

**Signature:** \_\_\_\_\_

**Date:** \_\_\_\_\_

**Email Address:** \_\_\_\_\_

### NON-DISCLOSURE AGREEMENT FOR USABILITY STUDY

THIS AGREEMENT is entered into as of October\_\_, 2017, between \_\_\_\_\_ ("the Participant") and Penn Medical, LLC.

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 Penn Medical, 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



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confidential and proprietary to Test Company 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.

Participant's printed name: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

### 5.3. APPENDIX 3- USABILITY INSTRUCTIONS

#### Usability Instructions (October 2017)

Administrator	
Data Logger	
Date	
Time	
Participant ID	

#### Orientation

We express our gratitude towards you for participating in this study. You will be helping us evaluate the workflows pertaining to the ONC's EHR vendor certification requirements. Our session today will last approximately 60 minutes. During that you will be provided with an overview in relation to Eye Doc and the modules involved under this testing.

The product you will be using today is Eye Doc, which you are already familiar with. It is, however, a non-production version, so all patients are fake.

As you go through the workflows, please keep in mind that it is Eye Doc under review here, not you.



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During this study, you will be asked to complete a few tasks using Eye Doc and answer some questions. We are interested in obtaining feedback regarding the ease of use of this product, what in the product you find most useful, and feedback as to how it can be improved.

You will be asked to complete these tasks on your own, trying to do them as quickly as possible with the fewest possible errors and deviations.

Please save your detailed comments until the end of a task or the end of the session as a whole, when we can discuss freely. Please feel free to be honest with your opinions.

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

Do you have any questions or concerns?

**Preliminary Questions**

Okay, now we need to ask you a few questions about yourself. What is your:

Education	
Occupation/Role	
Professional Experience	
Computer Experience	
Product Experience	

On a scale of 1 to 5, with 5 being “most familiar”, how would you rate your knowledge of the following:

Computerized Physician Order Entry	
Patient Demographic	
Problem list	
Medication list	



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Medication allergy list	
Clinical Decision Support (CDS)	
Implantable device list	
Clinical Information Reconciliation and Incorporation	

5.4. APPENDIX 4- SAFETY ENHANCED DESIGN TEST SCENARIOS

These tasks were selected based on the twelve ONC CEHRT2015 certification criteria, considering frequency of use, potential for risk to patient safety, and criticality of function.

The tasks were performed as follows-

The tasks are prioritized in accordance with the risks associated with user errors.

1. (a.9) Clinical Decision Support

**User Interaction: Medium**

**Potential Risk: High**

**Tasks**

1. Add a CDS intervention and/or reference resource for each of the required elements-
  - Problem list (SNOMED- 312904009 Moderate Non proliferative Diabetic Retinopathy)
  - Medication list (RxNorm Code- 388399 Carbamazepine 100mg)
  - Medication Allergy List (Penicillin G Potassium)
  - At least one Demographic (Race- American Indian)
  - Laboratory Test (LOINC- 47288-6 CBC w/o Differential panel-Cord Blood)
  - Vital Signs (BP= >130 and >90)
  - And a combination of at least 2 of the elements listed above (Demographics, Age= >20 years and Medication Allergy, Penicillin V; RxNorm code: 7984; Reaction: Dizziness)

**Success**

Please rate this task using the following scale:

- Very Difficult



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- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
Actual Task Time	

**Optimal Path:**

- Correct
  - Deviations
- If any, no. of deviations observed\_\_\_\_\_

**Observed errors and Verbalizations:**

**Rating:**

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

2. Trigger the CDS interventions/resources added using the applicable data elements from each of the required elements.
  - Go to the Vital Signs tab and enter Blood Pressure 140/95 mm/Hg {Please note that this would trigger a CDS based intervention alert, where the user needs to click on the “HELP” tab}

**Success**

Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy



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Expected Task Time	
Actual Task Time	

**Optimal Path:**

- Correct
  - Deviations
- If any, no. of deviations observed\_\_\_\_\_

**Observed errors and Verbalizations:**

**Rating:**

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

3. View the intervention/resource information using the Info button standard (HELP Tab) for data elements in the problem list, medication list, and demographics

**Success**

- Please rate this task using the following scale:
- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
Actual Task Time	

**Optimal Path:**

- Correct



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- Deviations  
If any, no. of deviations observed \_\_\_\_\_

Observed errors and Verbalizations:

Rating:

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

- 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

**Success**

- Please rate this task using the following scale:
- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
Actual Task Time	

Optimal Path:

- Correct
- Deviations  
If any, no. of deviations observed \_\_\_\_\_

Observed errors and Verbalizations:

Rating:



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On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

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

**Success**

Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
Actual Task Time	

Optimal Path:

- Correct
  - Deviations
- If any, no. of deviations observed\_\_\_\_\_

Observed errors and Verbalizations:

Rating:

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4



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5

## 2. (a.6) Problem List

**User Interaction: High**

**Potential Risk: High**

### Tasks

(Preexisting problem- Internal hordeolum ICD10- H00.021 SNOMED- 414521009)

1. Record a problem to the problem list-
  - SNOMED- 312904009 Moderate Non proliferative Diabetic Retinopathy

{Please note that this would trigger a CDS based intervention alert, where the user needs to click on the “HELP” tab}

### **Success**

Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
Actual Task Time	

### Optimal Path:

- Correct
  - Deviations
- If any, no. of deviations observed \_\_\_\_\_

### Observed errors and Verbalizations:

### Rating:

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

1



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- 2
- 3
- 4
- 5

2. Change a problem on the problem list

- RESOLVE internal hordeolum. ICD10- H00.021 SNOMED- 414521009

**Success**

Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
Actual Task Time	

Optimal Path:

- Correct
- Deviations

If any, no. of deviations observed\_\_\_\_\_

Observed errors and Verbalizations:

Rating:

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

3. Display the active problem list

- SNOMED- 312904009 Moderate Non proliferative Diabetic Retinopathy



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**Success**

Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
Actual Task Time	

**Optimal Path:**

- Correct
  - Deviations
- If any, no. of deviations observed\_\_\_\_\_

**Observed errors and Verbalizations:**

**Rating:**

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

- 4. Display the historical problem list
  - RESOLVE internal hordeolum. ICD10- H00.021 SNOMED- 414521009
  - SNOMED- 312904009 Moderate Non proliferative Diabetic Retinopathy

**Success**

Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy



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- Easy
- Very Easy

Expected Task Time	
Actual Task Time	

Optimal Path:

- Correct
- Deviations  
If any, no. of deviations observed\_\_\_\_\_

Observed errors and Verbalizations:

Rating:

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

3. (a.7) Medication List

**User Interaction: Medium**

**Potential Risk: Medium**

Tasks

(Preexisting medication- Lisinopril)

1. Record a medication to the medication list-
  - Carbamazepine 100mg, Oral, Once daily for 15 days. RxNorm Code- 388399

{Please note that this would trigger a CDS based intervention alert, where the user needs to click on the “HELP” tab}

**Success**



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Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
Actual Task Time	

Optimal Path:

- Correct
- Deviations

If any, no. of deviations observed \_\_\_\_\_

Observed errors and Verbalizations:

Rating:

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

2. Change a medication on the medication list

- Discontinue Lisinopril 20mg one capsule by mouth once daily for 30 days. RxNorm 197884

**Success**

Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy



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Expected Task Time	
Actual Task Time	

**Optimal Path:**

- Correct
- Deviations

If any, no. of deviations observed \_\_\_\_\_

**Observed errors and Verbalizations:**

**Rating:**

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

**3. Display the active medication list**

- Carbamazepine 100mg, Oral, Once daily for 15 days. RxNorm Code- 388399

**Success**

Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
Actual Task Time	

**Optimal Path:**

- Correct
- Deviations



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If any, no. of deviations observed\_\_\_\_\_

Observed errors and Verbalizations:

Rating:

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

4. Display the historical medication list

- Carbamazepine 100mg, Oral, Once daily for 15 days. RxNorm Code- 388399
- Discontinued Lisinopril 20mg one capsule by mouth once daily for 30 days. RxNorm 197884

**Success**

Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
Actual Task Time	

Optimal Path:

- Correct
- Deviations

If any, no. of deviations observed\_\_\_\_\_

Observed errors and Verbalizations:



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**Rating:**

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

**4. (a.2) CPOE Laboratory**

**User Interaction: Medium**

**Potential Risk: Medium**

Tasks

- Record a CPOE lab order- CBC w/o Differential panel-Cord Blood, LOINC-47288-6

{Please note that this would trigger a CDS based intervention alert, where the user needs to click on the “HELP” tab}

**Success**

Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
Actual Task Time	

**Optimal Path:**

- Correct
- Deviations

If any, no. of deviations observed\_\_\_\_\_



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Observed errors and Verbalizations:

Rating:

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

2. Change a CPOE lab order-

- Change the order to cell count panel, LOINC- 34556-1

**Success**

Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
Actual Task Time	

Optimal Path:

- Correct
  - Deviations
- If any, no. of deviations observed \_\_\_\_\_

Observed errors and Verbalizations:

Rating:

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1



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- 2
- 3
- 4
- 5

3. Display changed CPOE Lab order- cell count panel, LOINC- 34556-1

**Success**

Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
Actual Task Time	

Optimal Path:

- Correct
  - Deviations
- If any, no. of deviations observed\_\_\_\_\_

Observed errors and Verbalizations:

Rating:

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

**5. (a.3) CPOE Imaging**

**User Interaction: Medium**

**Potential Risk: Medium**



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**Tasks**

1. Record a CPOE image order-
  - Photo documentation eye- Right (LOINC-29111-2)

**Success**

Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
Actual Task Time	

**Optimal Path:**

- Correct
  - Deviations
- If any, no. of deviations observed\_\_\_\_\_

**Observed errors and Verbalizations:**

**Rating:**

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

2. Change the CPOE image order-
  - Retinal digital photography (LOINC- 65898-9)

**Success**

Please rate this task using the following scale:



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- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
Actual Task Time	

**Optimal Path:**

- Correct
- Deviations

If any, no. of deviations observed \_\_\_\_\_

**Observed errors and Verbalizations:**

**Rating:**

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

3. Display changed CPOE image order-
  - Corneal Topography CPT- 92025

**Success**

Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy



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Expected Task Time	
Actual Task Time	

**Optimal Path:**

- Correct
- Deviations

If any, no. of deviations observed \_\_\_\_\_

**Observed errors and Verbalizations:**

**Rating:**

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

**6. (a.1) CPOE Medication**

**User Interaction: Medium**

**Potential Risk: Medium**

Tasks

1. Record a CPOE medication order-
  - Tab Timolol- 20mg OD for 1month RxNorm- 198285

**Success**

Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
--------------------	--



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Actual Task Time	
------------------	--

Optimal Path:

- Correct
- Deviations

If any, no. of deviations observed\_\_\_\_\_

Observed errors and Verbalizations:

Rating:

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

2. Change a CPOE medication order-

- Tab Hydrochlorothiazide- 25mg OD FOR 1month RxNorm- 310798

**Success**

Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
Actual Task Time	

Optimal Path:

- Correct
- Deviations



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If any, no. of deviations observed\_\_\_\_\_

Observed errors and Verbalizations:

Rating:

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

3. Display changed CPOE medication order-

- Tab Hydrochlorothiazide- 25mg OD FOR 1month RxNorm- 310798

**Success**

Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
Actual Task Time	

Optimal Path:

- Correct
- Deviations

If any, no. of deviations observed\_\_\_\_\_

Observed errors and Verbalizations:

Rating:



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On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

### 7. (a.5) Demographics

**User Interaction: High**

**Potential Risk: High**

A new patient comes in for an appointment, search if the patient is in the system. If there is no patient that matches the search, click new patient to register this patient into the system.

#### Tasks

##### 1. Record demographics

- Record Date of Birth, 06/02/1985
- Record Sex, Female
- Record Race, American Indian (OMB- 1002-5) {Please note that this would trigger a CDS based intervention alert, where the user needs to click on the “HELP” tab}
- Record Ethnicity, Hispanic Latino (OMB- 2135-2)
- Record Preferred Language, English
- Record Sexual Orientation, Bisexual
- Record Gender Identity, Male-to-Female (MTF)/Transgender

#### **Success**

Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
Actual Task Time	



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**Optimal Path:**

- Correct
- Deviations

If any, no. of deviations observed \_\_\_\_\_

**Observed errors and Verbalizations:**

**Rating:**

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

**2. Change demographics**

- Change Date of Birth, 06/02/1984
- Change Sex, Male
- Change Race, White (OMB- 2106-3)
- Change Ethnicity, Declined to specify
- Change Preferred Language, Spanish
- Change Sexual Orientation, Straight/Heterosexual
- Change Gender Identity, Identifies as Male

**Success**

Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
Actual Task Time	

**Optimal Path:**

- Correct



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- Deviations  
If any, no. of deviations observed\_\_\_\_\_

Observed errors and Verbalizations:

Rating:

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

3. Display the patient’s changed preferred language, date of birth, birth sex, race, ethnicity, sexual orientation, gender identity

**Success**

Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
Actual Task Time	

Optimal Path:

- Correct
- Deviations  
If any, no. of deviations observed\_\_\_\_\_

Observed errors and Verbalizations:

Rating:



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On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

### 8. (a.8) Medication Allergy List

**User Interaction: High**

**Potential Risk: High**

#### Tasks

(Preexisting medication allergy- Codeine)

1. Record a medication allergy
  - Penicillin V; RxNorm code: 7984; Reaction: Dizziness

{Please note that this would trigger a CDS based intervention alert, where the user needs to click on the “HELP” tab}

#### **Success**

Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
Actual Task Time	

#### Optimal Path:

- Correct
  - Deviations
- If any, no. of deviations observed\_\_\_\_\_



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Observed errors and Verbalizations:

Rating:

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

2. Change a medication allergy

- INACTIVE Codeine; RxNorm code: 2670; Reaction: Diarrhoea and Abdominal Pain

**Success**

Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
Actual Task Time	

Optimal Path:

- Correct
- Deviations

If any, no. of deviations observed\_\_\_\_\_

Observed errors and Verbalizations:

Rating:



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On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

- 3. Display the active medication allergy list
  - Penicillin V; RxNorm code: 7984; Reaction: Dizziness

**Success**

Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
Actual Task Time	

Optimal Path:

- Correct
  - Deviations
- If any, no. of deviations observed\_\_\_\_\_

Observed errors and Verbalizations:

Rating:

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4



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5

4. Display the historical medication allergy list-

- Penicillin V; RxNorm code: 7984; Reaction: Dizziness
- INACTIVE Codeine; RxNorm code: 2670; Reaction: Diarrhoea and Abdominal Pain

**Success**

Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
Actual Task Time	

Optimal Path:

- Correct
- Deviations

If any, no. of deviations observed\_\_\_\_\_

Observed errors and Verbalizations:

Rating:

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

9. (a.14) Implantable Device List

**User Interaction: Medium**

**Potential Risk: High**



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Tasks

1. Record UDI

- =/W4146EB0010T0475=,000025=A99971312345600=>014032=}013032&,10000000000XYZ123

**Success**

Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
Actual Task Time	

Optimal Path:

- Correct
  - Deviations
- If any, no. of deviations observed \_\_\_\_\_

Observed errors and Verbalizations:

Rating:

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

2. Change the status of the Unique Device Identifier (UDI)

**Success**



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Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
Actual Task Time	

Optimal Path:

- Correct
  - Deviations
- If any, no. of deviations observed \_\_\_\_\_

Observed errors and Verbalizations:

Rating:

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

3. Access UDI, device description, identifiers and attributes

**Success**

Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy



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Expected Task Time	
Actual Task Time	

Optimal Path:

- Correct
- Deviations

If any, no. of deviations observed \_\_\_\_\_

Observed errors and Verbalizations:

Rating:

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

### 10.(b.2) Clinical Information Reconciliation and Incorporation

**User Interaction: High**

**Potential Risk: High**

Tasks

(Please note that CDS based intervention alert for Problem List, Medication List and Medication allergy list has already been added)

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.

{Please note that this would trigger a CDS based intervention alert}

**Success**

Please rate this task using the following scale:



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- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
Actual Task Time	

**Optimal Path:**

- Correct
  - Deviations
- If any, no. of deviations observed \_\_\_\_\_

**Observed errors and Verbalizations:**

**Rating:**

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

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

**Success**

Please rate this task using the following scale:

- Very Difficult
- Difficult
- Neither Difficult nor Easy
- Easy
- Very Easy

Expected Task Time	
Actual Task Time	



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Optimal Path:

- Correct
- Deviations

If any, no. of deviations observed \_\_\_\_\_

Observed errors and Verbalizations:

Rating:

On a scale of 1 to 5, with 5 being “very easy to use”, how would you rate the ease of use for completing this task?

- 1
- 2
- 3
- 4
- 5

### 5.5. APPENDIX 5- POST TEST QUESTIONNAIRE

Based on your overall experience with all the tasks, please answer the following questions:

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

Strongly Disagree				Strongly Agree
1	2	3	4	5

2. I found the system unnecessarily complex

Strongly Disagree				Strongly Agree
1	2	3	4	5

3. I thought that the system was easy to use

Strongly Disagree				Strongly Agree
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

Strongly Disagree				Strongly Agree
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1	2	3	4	5

5. I found the various functions in this system were well integrated

Strongly Disagree

Strongly Agree

1	2	3	4	5

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

Strongly Disagree

Strongly Agree

1	2	3	4	5

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

Strongly Disagree

Strongly Agree

1	2	3	4	5

8. I found the system very cumbersome to use

Strongly Disagree

Strongly Agree

1	2	3	4	5

9. I felt very confident using the system

Strongly Disagree

Strongly Agree

1	2	3	4	5

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

Strongly Disagree

Strongly Agree

1	2	3	4	5