

## **EHR Usability Test Report of Office Practicum, V 20**

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

Date of Usability Test: March 2019 - April 2019  
Date of Report: May 1, 2019  
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## EXECUTIVE SUMMARY

A usability test of Office Practicum, V 20 was conducted from March 22, 2019 to April 12, 2019 remotely by the Office Practicum user experience architect. The purpose of this test was to test and validate the usability of the current user interface, and provide evidence of usability in the EHR Under Test (EHRUT).

During the usability test, 10 healthcare providers 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:

Criteria	Task
170.315(a)(1) Computerized provider order entry - medications	<ol style="list-style-type: none"> <li>1. Record medication via CPOE</li> <li>2. Change and display medication via CPOE</li> </ol>
170.315(a)(2) Computerized provider order entry - laboratory	<ol style="list-style-type: none"> <li>1. Record lab order via CPOE</li> <li>2. Change and display lab order via CPOE</li> </ol>
170.315(a)(3) Computerized provider order entry - Diagnostic imaging	<ol style="list-style-type: none"> <li>1. Record Imaging order via CPOE</li> <li>2. Change and display Imaging order via CPOE</li> </ol>
170.315(a)(6) Problem list	<ol style="list-style-type: none"> <li>1. Record a problem to the problem list</li> <li>2. Change a problem on the problem list</li> </ol>
170.315(a)(7) Medication list	<ol style="list-style-type: none"> <li>1. Change and display active and historical medications on the medication list</li> </ol>
170.315(a)(8) Medication allergy list	<ol style="list-style-type: none"> <li>1. Record a medication allergy</li> <li>2. Change a medication allergy</li> </ol>

During the 60 minute one-on-one usability test, each participant was greeted by the administrator, and data logger. They were instructed that they could withdraw at any time. Participants had prior experience with a previous version of Office Practicum. 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 who recorded user performance data on paper and electronically. The administrator did not give the participant assistance in how to complete the task.

Participant screens, and audio were recorded for subsequent analysis.

The following types of data were collected for each participant:

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

All participant data was de-identified – no correspondence could be made from the identity of the participant to the data collected. Following the conclusion of the testing, participants were asked to complete a post-test questionnaire. Various recommended metrics, in accordance with the examples set forth in the *NIST Guide to the Processes Approach for Improving the Usability of Electronic Health Records*, were used to evaluate the usability of the EHRUT. Following is a summary of the performance and rating data collected on the EHRUT.

The results from the System Usability Scale scored the subjective satisfaction with the system based on performance with these tasks to be: **79.72**.

Scores under 60 represent systems with poor usability; scores over 80 would be considered above average.

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

### **Major findings**

- Most participants preferred to select the medication and then click “Edit” instead of double clicking on the medication in the data table.
- Horizontal scrolling tables cause a lot of confusion when looking for more details
- Participants preferred to see an icon and label inside primary buttons
- Some participants only use Office Practicum on their laptop
- Some participants prefer to navigate Office Practicum with only their keyboard
- The flow to add and edit orders had a lot of wording and modals, which added to alert fatigue.
- The modal that explains if you want to delete, add, or combine orders was hard to scan
- Participants mentioned that they liked documenting when they were either deleting or overriding items.
- They wanted to type the minimal amount to narrow down a search list instead of needing to click on the search button to show the list.
- Many participants mentioned they would delete the medication over changing the status.

- It takes a long time to show the full search modal after typing in a medication allergy and clicking on the search icon. These slow modals take up a lot of time.
- Many participants preferred seeing inline messages and warnings instead of modals.

### **Areas for improvement**

- Add the sig closer to the medication name instead of a few columns away.
- On the medication list, add what pharmacy the medication was sent to and the phone number for that pharmacy
- When recording a new medication, have the medication input field become active automatically saving the user a click
- When adding orders, make the wording in the modal clearer and easier to read when editing, adding, or deleting.
- Consider improving the scrolling dropdown user experience throughout Office Practicum for users that prefer to use a keyboard over a mouse.
- Make the medication allergy input field search open when the user hits “Enter” on their keyboard.
- Make inline messages stand out more from other content.

## INTRODUCTION

The EHRUT tested for this study was Office Practicum, V 20. Designed to present medical information to physicians in pediatric offices, the EHRUT consists of a comprehensive electronic health system used to create, store, and retrieve patient data. The usability testing attempted to represent realistic exercises and conditions.

The purpose of this study was to test and validate the usability of the current user interface, and provide evidence of usability in the EHR Under Test (EHRUT). To this end, measures of effectiveness, efficiency and user satisfaction, such as task success, time on task, and task errors were captured during the usability testing.

## METHOD

### Participants

A total of 10 participants were tested on Office Practicum, V 20. Participants in the test were pediatricians, physicians, and practice administrators . Participants were recruited by the user experience architect Sean Menne. In addition, participants had no direct connection to the development of or organization producing Office Practicum, V 20. 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.

For the test purposes, end-user characteristics were identified and translated into a recruitment screener used to solicit potential participants; an example of a screener is provided in **Appendix 1**.

Recruited participants had a mix of backgrounds and demographic characteristics conforming to the recruitment screener. 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
01	Male	60-69	Doctorate degree (eg., MD, DNP, DMD, PhD)	Pediatrician	300	360	108	No
02	Male	50-59	Doctorate degree (eg., MD, DNP, DMD, PhD)	Pediatrician	240	240	60	No
03	Female	50-59	Doctorate degree (eg., MD, DNP, DMD, PhD)	Physician	252	96	96	No
04	Male	60-69	Doctorate degree (eg., MD, DNP, DMD, PhD)	MD	444	420	96	No
05	Female	40-49	Doctorate degree (eg., MD, DNP, DMD, PhD)	Pediatrician	192	252	120	No
06	Male	30-39	Doctorate degree (eg., MD, DNP, DMD, PhD)	Pediatrician	96	360	24	No
07	Male	50-59	Doctorate degree (eg., MD, DNP, DMD, PhD)	Pediatrician	252	456	60	No
08	Male	60-69	Doctorate degree (eg., MD, DNP, DMD, PhD)	Physician	408	300	36	No
09	Male	40-49	Doctorate degree (eg., MD, DNP, DMD, PhD)	Physician, Practice Manager	180	504	108	No
10	Female	50-59	Doctorate degree (eg., MD, DNP, DMD, PhD)	Doctor	336	240	24	No

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. See **Appendix 2** for more patient demographics.

Participants were scheduled for 60 minute sessions. After each session the administrator would reset the system. A spreadsheet was used to keep track of the participant schedule, and included each participant's demographic characteristics as provided by the recruiting questionnaire.

## **Study Design**

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

During the usability test, participants interacted with the same version of Office Practicum, V 20. Each participant used the system from their computer, 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 Data Scoring data table.

## **Tasks**

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

Tasks	Safety Risk Score (1-Least Risky, 5-Most Risky)
Record medication via CPOE	5
Change and display medication via CPOE	5
Record lab order via CPOE	4
Change and display lab order via CPOE	4
Record imaging order via CPOE	4
Change and display imaging order via CPOE	4
Record a problem to the problem list	3
Change a problem on the problem list	3
Change and display active and historical medications on the medication list	5
Record a medication allergy	5
Change a medication allergy	5

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

## Procedures

Upon arrival, participants were greeted; their identity was verified and matched with a name on the participant schedule. Participants were then assigned a participant ID. To ensure that the test ran smoothly, two staff members participated in this test, the usability administrator and the data logger. The administrator moderated the session including administering instructions and tasks. The administrator also obtained post-task rating data, and took notes on participant comments. A second person served as the data logger and took notes on task time, 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 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 the Data Scoring data table.

Following the session, the administrator emailed the participant the post-test questionnaire (System Usability Scale, see **Appendix 3**), 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**

The usability sessions for this study were all conducted remotely. The test administrator, data logger, and participants were all in different locations.

### **Test Environment**

Office Practicum, V 20 would typically be used in a healthcare office or facility. In this instance, the testing was conducted using GoTo Meeting software. To ensure a realistic environment, participants were asked to interact with the system using their own computer. Participants were given an access code to dial into GoTo Meeting where the administrator would share their screen and give the participants keyboard and mouse control to perform their tasks.

Office Practicum, V 20 was running on a Windows computer using a test database. Technically, the system performance (i.e., response time) was representative of what actual users would experience in a field implementation.

### **Test Forms and Tools**

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

1. Moderator's Guide - used to capture test data such task success, task errors, task time, task rating, and verbalizations.
2. Post-test Questionnaire - Emailed to the participant after the session concluded.

The participant's interaction with Office Practicum, V 20 were captured and recorded digitally with screen capture software running on the test machine, and verbal comments were recorded as well.

## Participant Instructions

The administrator reads the following instructions aloud to each participant (also see the full moderator's guide in **Appendix 4**):

*I want to thank you for participating in this study. Your input is very important.*

*Our session today will last about 60 minutes. I'm going to use a test instance of OP, and I will ask you to complete a few tasks and answer some questions afterwards.*

*Please try to complete the tasks on your own while following the participant guide. I'm able to answer any questions, but I won't be able to help with completing the tasks so if you can't complete it just say so. 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.*

*Overall, we are interested in how easy (or difficult) this system is to use, and how we could improve it. All of the information that you provide will be kept confidential and your name will not be associated with our reporting.*

*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 will ask you to rate the task and your impressions about the task once you are done.*

Following the procedural instructions, participants were shown the EHR and given keyboard and mouse control. Once each task was complete, the administrator gave the following instructions:

*How would you rate this task on a scale of 1 to 5, with 1 being hard and 5 being easy.  
What were your overall impressions of this task?*

## 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 OP20 by measuring participant success rates and errors
2. Efficiency of OP20 by measuring the average task time and path deviations
3. Satisfaction with OP20 by measuring ease of use ratings

## Data Scoring

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

Measures	Rationale and Scoring
<p><b>Effectiveness:</b> Task Success</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. 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.</p>
<p><b>Effectiveness:</b> 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 an “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. Not all deviations would be counted as errors.<sup>11</sup> This should also be expressed as the mean number of failed tasks per participant.</p>

	<p>On a qualitative level, an enumeration of errors and error types should be collected.</p>
<p><b>Efficiency:</b> 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. 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 deviation be reports. Optimal paths (i.e., procedural steps) should be recorded when construction tasks.</p>
<p><b>Efficiency:</b> 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. 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><b>Satisfaction:</b> 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. 12</p> <p>Common convention is that average ratings for systems judged easy to use should be 3.3 or above.</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 5.13</p>

## RESULTS

### Data Analysis and Reporting

The results of the usability test were calculated according to the methods specified in the Usability Metrics section above. Participants who failed to follow session and task instructions had their data excluded from the analyses. Connection issues were experienced during the usability session with participant 04. Tasks took longer to complete, but they were able to finish the entire session.

The usability testing results for Office Practicum, V 20 are detailed below. The data should yield actionable results that, if corrected, yield material, positive impact on user performance.

## Criteria 170.315(a)(1) - CPOE Medications

Criteria 170.315(a)(1) - CPOE Medications							
Task 1: Record medication via CPOE							
Participant ID	Task Success	Task Path Deviation - Observed Steps	Task Path Deviation - Optimal Steps	Task Tme Deviations - Observed	Task Time Deviations - Optimal	Task Errors	Task Rating
1	1	8	8	87	39	0	3
2	1	8	8	91	39	0	5
3	1	8	8	99	39	0	5
4	1	8	8	97	39	0	4
5	1	8	8	92	39	0	5
6	1	9	8	64	39	1	5
7	1	8	8	101	39	0	4
8	1	8	8	72	39	0	5
9	1	8	8	52	39	0	5
10	1	19	8	251	39	0	5
<b>Total</b>	10					1	
<b>MEAN</b>	100%	9.2		100.6		0.1	4.6
<b>SD</b>	0	3.3		52.4		0.3	0.7

Criteria 170.315(a)(1) - CPOE Medications							
Task 2: Change and display medication via CPOE							
Participant ID	Task Success	Task Path Deviation - Observed Steps	Task Path Deviation - Optimal Steps	Task Tme Deviations - Observed	Task Time Deviations - Optimal	Task Errors	Task Rating
1	1	4	4	13	9	0	5
2	1	4	4	14	9	0	5
3	1	4	4	14	9	0	5
4	1	4	4	14	9	0	5
5	1	4	4	18	9	0	5
6	1	4	4	11	9	0	5
7	1	4	4	19	9	0	5
8	1	4	4	8	9	0	5
9	1	4	4	6	9	0	5
10	1	4	4	12	9	0	5
<b>Total</b>	10					0	
<b>MEAN</b>	100%	4		12.9		0	5
<b>SD</b>	0	0		3.8		0	0

## Discussion of Findings

Participants were given 2 tasks:

1. Record medication via CPOE
2. Change and display medication via CPOE

## Effectiveness

### **Record medication via CPOE**

The success score for this task was 100%. Participants were easily able to record a medication.

### **Change and display medication via CPOE**

The success score for this task was 100%. Participants were easily able to change a medication.

## Efficiency

### **Record medication via CPOE**

80% of the participants were able to complete this task using the optimal amount of steps. Participant 10 had trouble entering the medication name which increased their step count. Participant 6 selected the wrong dose for the medication and had to go back and select the correct dose before saving the medication. The average time to complete the task was 100.6 seconds compared to the optimal time of 39 seconds.

### **Change and display medication via CPOE**

100% of the participants were able to complete this task using the optimal amount of steps. The average time to complete the task was 12.9 seconds. 20% of the participants were able to complete the task under the optimal time.

## Satisfaction

### **Record medication via CPOE**

The average satisfaction rating for this task was 4.6 out of 5 on the Likert scale.

### **Change and display medication via CPOE**

The average satisfaction rating for this task was 5 out of 5 on the Likert scale.

## Major Findings

- All participants were able to easily add and edit medications.
- Most participants preferred to select the medication and then click “Edit” instead of double clicking on the medication in the data table.
- Many participants rely on their “Favorite” list.
- Horizontal scrolling tables cause a lot of confusion when looking for more details.

## Areas for Improvement

- Add the sig closer to the medication name instead of a few columns away.
- On the medication list, add what pharmacy the medication was sent to, and the phone number for that pharmacy.
- When recording a new medication, have the medication input field become active automatically saving the user a click.

## Criteria 170.315(a)(2) - CPOE Laboratory

Criteria 170.315(a)(2) - CPOE Laboratory							
Task 1: Record Lab order via CPOE							
Participant ID	Task Success	Task Path Deviation - Observed Steps	Task Path Deviation - Optimal Steps	Task Tme Deviations - Observed	Task Time Deviations - Optimal	Task Errors	Task Rating
1	1	8	8	37	16	0	4
2	1	10	8	99	16	2	3
3	1	8	8	22	16	0	5
4	1	8	8	33	16	0	5
5	1	8	8	60	16	0	4
6	1	8	8	26	16	0	4
7	1	13	8	99	16	4	4
8	1	8	8	30	16	0	4
9	1	8	8	48	16	0	5
10	1	8	8	15	16	0	5
<b>Total</b>	10					6	
<b>MEAN</b>	100%	8.7		46.9		0.6	4.3
<b>SD</b>	0	1.6		28.7		1.3	0.6

Criteria 170.315(a)(2) - CPOE Laboratory							
Task 2: Change and display lab order via CPOE							
Participant ID	Task Success	Task Path Deviation - Observed Steps	Task Path Deviation - Optimal Steps	Task Tme Deviations - Observed	Task Time Deviations - Optimal	Task Errors	Task Rating
1	1	7	7	24	17	0	5
2	1	7	7	21	17	0	5
3	1	7	7	32	17	0	4
4	1	7	7	21	17	0	5
5	1	7	7	35	17	0	5
6	1	7	7	23	17	0	3
7	1	7	7	26	17	0	4
8	1	7	7	48	17	0	4
9	1	9	7	31	17	1	5
10	1	7	7	19	17	0	5
<b>Total</b>	10					1	
<b>MEAN</b>	100%	7.2		28		0.1	4.5
<b>SD</b>	0	0.6		8.4		0.3	0.7

## Discussion of Findings

Participants were given 2 tasks:

1. Record lab order via CPOE
2. Change and display lab order via CPOE

## Effectiveness

### Record lab order via CPOE

The success score for this task was 100%. Participants were easily able to record a lab order.

### Change and display lab order via CPOE

The success score for this task was 100%. Participants were easily able to change a lab order.

## Efficiency

### Record lab order via CPOE

80% of the participants were able to complete the task using the optimal steps. The average task time was 46.9 seconds compared to the optimal task time of 16 seconds. Task errors were caused by confusion due to a different encounter layout.

### Change and display lab order via CPOE

90% of the participants were able to complete the task using the optimal steps. The average task time was 28 seconds compared to the optimal time of 17 seconds. Participant 9 navigated to another screen first before completing the task.

## Satisfaction

### Record lab order via CPOE

The average satisfaction rating for this task was 4.3 out of 5 on the Likert scale.

### Change and display lab order via CPOE

The average satisfaction rating for this task was 4.5 out of 5 on the Likert scale.

## Major Findings

- Many participants took awhile to adjust to the layout of a new encounter note.
- Participants found the button labels to be confusing when creating a lab order.
- The “Overview” tab and “Lab” tab look identical causing confusion.
- Some participants mentioned the flow to add and edit orders had a lot of wording and modals, which added to alert fatigue.

## Areas for Improvement

- Make the wording in the modal clearer and easier to read when editing, adding, or deleting orders
- Make it more clear whether you're on the "Overview" tab or the "Labs" tab.
- Find a way to reduce all the modals throughout the flow that add to alert fatigue and overall click count.

## Criteria 170.315(a)(3) - CPOE Diagnostic Imaging

Criteria 170.315(a)(3) - CPOE Diagnostic Imaging							
Task 1: Record Imaging order via CPOE							
Participant ID	Task Success	Task Path Deviation - Observed Steps	Task Path Deviation - Optimal Steps	Task Tme Deviations - Observed	Task Time Deviations - Optimal	Task Errors	Task Rating
1	1	6	6	34	10	0	5
2	1	6	6	49	10	0	5
3	1	6	6	22	10	0	5
4	1	6	6	24	10	0	5
5	1	6	6	13	10	0	5
6	1	6	6	11	10	0	4
7	1	6	6	32	10	0	4
8	1	6	6	17	10	0	4
9	1	6	6	23	10	0	5
10	1	6	6	16	10	0	5
<b>Total</b>	10					0	
<b>MEAN</b>	100%	6		24.1		0	4.7
<b>SD</b>	0	0		10.9		0	0.5

Criteria 170.315(a)(3) - CPOE Diagnostic Imaging							
Task 2: Change and display imaging order via CPOE							
Participant ID	Task Success	Task Path Deviation - Observed Steps	Task Path Deviation - Optimal Steps	Task Tme Deviations - Observed	Task Time Deviations - Optimal	Task Errors	Task Rating
1	1	5	5	30	15	0	5
2	0	N/A	5	N/A	15	N/A	1
3	0	9	5	98	15	1	3
4	1	5	5	29	15	0	5
5	1	5	5	61	15	0	5
6	1	13	5	94	15	0	4
7	1	10	5	79	15	1	3
8	1	5	5	36	15	0	3
9	1	8	5	57	15	1	5
10	1	12	5	76	15	2	1
<b>Total</b>	8					4	
<b>MEAN</b>	80%	8		62.2		0.9	3.5
<b>SD</b>	0.4	3.0		25.0		0.7	1.5

## Discussion of Findings

Participants were given 2 tasks:

1. Record imaging order via CPOE
2. Change and display imaging order via CPOE

## Effectiveness

### **Record imaging order via CPOE**

The success score for this task was 100%. Participants were easily able to record a imaging order.

### **Change and display imaging order via CPOE**

The success score for this task was 80%. 2 participants were not able to complete the task.

## Efficiency

### **Record imaging order via CPOE**

100% of the participants were able to complete the task using the optimal steps. The average task time was 24.1 seconds compared to the optimal task time of 10 seconds. No errors were made by the participants.

### **Change and display imaging order via CPOE**

40% of the participants were able to complete the task using the optimal steps. The average task time was 62.2 seconds compared to the optimal task time of 15 seconds. 3 participants tried to edit the order through the “Overview” screen which caused errors, but they were able to get back on track and finish the task.

## Satisfaction

### **Record imaging order via CPOE**

The average satisfaction rating for this task was 4.7 out of 5 on the Likert scale.

### **Change and display imaging order via CPOE**

The average satisfaction rating for this task was 3.5 out of 5 on the Likert scale. This was the lowest satisfaction rating out of all the tasks presented during the usability session.

## Major Findings

- All participants were able to easily record an imaging order.
- The modal that explains if you want to delete, add, or combine orders was hard to scan.

- Participants mentioned that the screens in the flow looked similar, so it was hard to understand if the task was completed.
- One provider was confused about where to select a provider before ordering.

### Areas for Improvement

- Clean up, and organize the wording in the modal that lets users delete, add, or edit orders.
- Fix the button labels for creating orders instead of having three action buttons that look identical.
- Make the “Overview” tab look visually different from the “Lab” tab where you order.

## Criteria 170.315(a)(6) - Problem List

Criteria 170.315(a)(6) - Problem List							
Task 1: Record a problem to the problem list							
Participant ID	Task Success	Task Path Deviation - Observed Steps	Task Path Deviation - Optimal Steps	Task Tme Deviations - Observed	Task Time Deviations - Optimal	Task Errors	Task Rating
1	1	5	5	21	14	0	5
2	1	5	5	24	14	0	5
3	1	5	5	23	14	0	5
4	1	5	5	235	14	0	5
5	1	5	5	23	14	0	5
6	1	5	5	25	14	0	4
7	1	5	5	23	14	0	5
8	1	5	5	31	14	0	4
9	1	5	5	12	14	0	5
10	1	5	5	22	14	0	5
<b>Total</b>	10					0	
<b>MEAN</b>	100%	5		43.9		0	4.8
<b>SD</b>	0	0		63.9		0	0.4

Criteria 170.315(a)(6) - Problem List							
Task 2: Change a problem on the problem list							
Participant ID	Task Success	Task Path Deviation - Observed Steps	Task Path Deviation - Optimal Steps	Task Tme Deviations - Observed	Task Time Deviations - Optimal	Task Errors	Task Rating
1	1	4	4	15	8	0	5
2	1	4	4	5	8	0	5
3	1	4	4	19	8	0	5
4	1	4	4	248	8	0	5
5	1	4	4	19	8	0	5
6	1	4	4	12	8	0	5
7	1	4	4	16	8	0	5
8	1	4	4	5	8	0	5
9	1	4	4	3	8	0	5
10	1	4	4	16	8	0	5
<b>Total</b>	10					0	
<b>MEAN</b>	100%	4		35.8		0	5
<b>SD</b>	0	0		71.0		0	0

## Discussion of Findings

Participants were given 2 tasks:

1. Record a problem to the problem list
2. Change a problem on the problem list

### Effectiveness

#### **Record a problem to the problem list**

The success score for this task was 100%. Participants were easily able to record a problem to the problem list.

#### **Change a problem on the problem list**

The success score for this task was 100%. Participants were easily able to change a problem on the problem list.

### Efficiency

#### **Record a problem to the problem list**

100% of the participants were able to complete the task using the optimal steps. The average task time was 43.9 seconds compared to the optimal task time of 14 seconds. There were no task errors.

#### **Change a problem on the problem list**

100% of the participants were able to complete the task using the optimal steps. The average task time was 35.8 seconds compared to the optimal task time of 8 seconds. 30% of the participants were able to complete the task under the optimal time. There were no task errors.

### Satisfaction

#### **Record a problem to the problem list**

The average satisfaction rating for this task was 4.8 out of 5 on the Likert scale.

#### **Change a problem on the problem list**

The average satisfaction rating for this task was 5 out of 5 on the Likert scale.

### Major Findings

- Some problems need snomed and some need icd-10, it would be nice if they suggested one when you enter the other.

- Participants mentioned when search for a problem that they wanted to type the minimal amount to narrow down the list instead of needing to click on the search button to show the list.
- Some participants wanted the ICD10 code to auto populate based on the problem they selected above.

### Areas for Improvement

- Might be nice to have a button to “copy to sibling”.
- Participants liked the minimal search UI for problems instead of the larger search box that takes longer to load in other sections of the patient's chart.
- Have the “Problem” input field highlighted when the user adds a new problem so it saves a click.

## Criteria 170.315(a)(7) - Medication List

Criteria 170.315(a)(7) - Medication List							
Task 1: Change and display active and historical medications on the medication list							
Participant ID	Task Success	Task Path Deviation - Observed Steps	Task Path Deviation - Optimal Steps	Task Tme Deviations - Observed	Task Time Deviations - Optimal	Task Errors	Task Rating
1	1	2	2	16	5	0	5
2	1	2	2	20	5	0	5
3	1	2	2	14	5	0	5
4	1	6	2	44	5	0	3
5	1	6	2	19	5	0	5
6	1	2	2	6	5	0	5
7	1	2	2	10	5	0	5
8	1	5	2	33	5	1	5
9	1	2	2	6	5	0	5
10	1	2	2	19	5	0	5
<b>Total</b>	10					1	
<b>MEAN</b>	100%	3.1		18.7		0.1	4.8
<b>SD</b>	0	1.7		11.3		0.3	0.6

## Discussion of Findings

Participants were given 1 task:

1. Change and display active and historical medications on the medication list

### Effectiveness

The success score for this task was 100%. Participants were easily able to change a medication on a medication list.

### Efficiency

70% of the participants were able to complete the task using the optimal steps. The average task time was 18.7 seconds compared to the optimal task time of 5 seconds. Participant 8 mentioned they normally delete the medication instead of changing the status. They were able to complete the task.

### **Satisfaction**

The average satisfaction rating for this task was 4.8 out of 5 on the Likert scale.

### **Major Findings**

- Many participants mentioned they would delete the medication over changing the status.
- Using a keyboard to navigate causes issues for scrolling inside long dropdowns that hide more options.

### **Areas for Improvement**

- Consider improving the scrolling dropdown user experience for users that prefer to use a keyboard over a mouse.

## **Criteria 170.315(a)(8) - Medication Allergy List**

**Criteria 170.315(a)(8) - Medication Allergy List**

**Task 1: Record a medication allergy**

Participant ID	Task Success	Task Path Deviation - Observed Steps	Task Path Deviation - Optimal Steps	Task Tme Deviations - Observed	Task Time Deviations - Optimal	Task Errors	Task Rating
1	1	6	6	141	56	0	4
2	1	6	6	184	56	0	5
3	1	6	6	8340	56	0	5
4	1	6	6	149	56	0	5
5	1	6	6	172	56	0	5
6	1	6	6	109	56	0	4
7	1	6	6	59	56	0	4
8	1	6	6	67	56	0	3
9	1	6	6	81	56	0	5
10	1	6	6	50	56	0	4
<b>Total</b>	10					0	
<b>MEAN</b>	100%	6		935.2		0	4.4
<b>SD</b>	0	0		2468.7		0	0.7

**Criteria 170.315(a)(8) - Medication Allergy List**

**Task 2: Change a medication allergy**

Participant ID	Task Success	Task Path Deviation - Observed Steps	Task Path Deviation - Optimal Steps	Task Tme Deviations - Observed	Task Time Deviations - Optimal	Task Errors	Task Rating
1	1	4	4	13	8	0	5
2	1	4	4	15	8	0	5
3	1	4	4	3	8	0	5
4	1	4	4	16	8	0	5
5	1	4	4	16	8	0	5
6	1	4	4	9	8	0	5
7	1	4	4	11	8	0	5
8	1	4	4	8	8	0	5
9	1	4	4	7	8	0	5
10	1	4	4	10	8	0	5
<b>Total</b>	10					0	
<b>MEAN</b>	100%	4		10.8		0	5
<b>SD</b>	0	0		4.0		0	0

**Discussion of Findings**

Participants were given 2 tasks:

1. Record a medication allergy
2. Change a medication allergy

**Effectiveness**

### **Record a medication allergy**

The success score for this task was 100%. Participants were easily able to record a medication allergy.

### **Change a medication allergy**

The success score for this task was 100%. Participants were easily able to change a medication allergy.

## **Efficiency**

### **Record a medication allergy**

100% of the participants were able to complete the task using the optimal steps. The average task time was 935.2 seconds compared to the optimal task time of 56 seconds. Participant 3 struggled with connection issues during this task, which raised the average seconds to complete this task. They were able to successfully complete the task.

### **Change a medication allergy**

100% of the participants were able to complete the task using the optimal steps. The average task time was 10.8 seconds compared to the optimal task time of 8 seconds. This task had the closest average time to optimal time. There were no task errors.

## **Satisfaction**

### **Record a medication allergy**

The average satisfaction rating for this task was 4.4 out of 5 on the Likert scale.

### **Change a medication allergy**

The average satisfaction rating for this task was 5 out of 5 on the Likert scale.

## **Major Findings**

- It takes a long time to show the full search modal after typing in a medication allergy and clicking on the search icon. These slow modals take up a lot of time.
- After typing in the medication allergy the user can't hit "Enter" on their keyboard, they have to click on the search icon which slows them down.
- Since "Penicillin" was added as a medication allergy, some participants mentioned they would like to see the "Allergy Group" below fill in with "Penicillin" as well, so the whole experience would be quicker.

## **Areas for Improvement**

- Experiment with showing a less robust search modal first and let the user select more options if they need them.
- Make the medication allergy input field search open when the user hits “Enter” on their keyboard.
- Make the medication allergy form smarter by filling in data such as “Allergy Group”.

## **APPENDICES**

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

1. Sample recruiting emails
2. Participant demographics
3. Example moderator's guide
4. System usability scale questionnaire

## **Appendix 1: Sample Recruiting Emails**

## First Round

We are recruiting clinicians (physicians, NPs, and PAs) to participate in a usability study. This is strictly for research purposes, and would only take around 60 minutes of your time. This study will take place via an online GoToMeeting, and will be recorded. You may schedule your participation at your convenience. We will be getting your feedback while you perform some basic tasks within the patients chart and demographics. Please fill out this quick questionnaire if you're interested in improving OP. If you have questions, please contact Sean Menne at [smenne@officepracticum.com](mailto:smenne@officepracticum.com).

## Second Round

My name is Sean, and I am the UX architect at Office Practicum. I want to thank you for filling out our usability questionnaire.

This usability session will be strictly for research purposes, and only take around 60 minutes of your time. This session will take place via GoTo Meeting, and will be recorded for later reference. I will attach a meeting link to our calendars once a date and time have been chosen.

I have attached a PDF (SED Participant Guide.pdf) to this email that has a list of tasks you will perform during the session. Please print out the PDF and have it with you during the session for reference.

To get this session started please click on the "RESERVE TIME" button below and choose a time slot that fits your schedule.

[RESERVE TIME](#)

Thanks again, and I look forward to meeting you soon.

## Appendix 2: Participant Demographics

### Gender

Men	7
Women	3
Total	10

### Occupation/Role

Doctor	1
MD	1
Pediatrician	5
Physician	2
Physician / Practice Owner	1

### Age

30-39	1
40-49	2
50-59	4
60-69	3

### Education

Doctorate degree (eg., MD, DNP, DMD, PhD)	10
---	----

### Experience

Years since completed professional training (Average)	23
Years of Computer experience (Average)	27
Years of Office Practicum Experience (Average)	6

## Appendix 3: System Usability Scale Questionnaire

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

Strongly Disagree    1    2    3    4    5    Strongly Agree

2. I found the system unnecessarily complex

Strongly Disagree    1    2    3    4    5    Strongly Agree

3. I thought the system was easy to use

Strongly Disagree    1    2    3    4    5    Strongly Agree

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

Strongly Disagree    1    2    3    4    5    Strongly Agree

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

Strongly Disagree    1    2    3    4    5    Strongly Agree

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

Strongly Disagree    1    2    3    4    5    Strongly Agree

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

Strongly Disagree    1    2    3    4    5    Strongly Agree

8. I found the system very cumbersome to use

Strongly Disagree    1    2    3    4    5    Strongly Agree

9. I felt very confident using the system

Strongly Disagree    1    2    3    4    5    Strongly Agree

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

Strongly Disagree    1    2    3    4    5    Strongly Agree

## Appendix 4: Example Moderator's Guide

## MODERATORS GUIDE 1

### **EHRUT Usability Test**

**Administrator:**

**Data Logger:**

**Date:**

**Time:**

**Participant #:**

**Location:**

### **Session 1: CPOE Medications**

#### **TASK 1: Record medication via CPOE**

*Add Amox 250 mg chew starter to Josiah's medication list*

*1 tab a day mouth 3 times for 10 days*

#### **Optimal Path**

1. *Click "ADD" button*
2. *Add "Amox 250 mg chew starter"*
3. *1 tab a day by mouth*
4. *Once a day*
5. *Days Supply: 10*
6. *Disp# 1 Tablet*
7. *Refills: 0*
8. *Save Medication*

Correct

Minor Deviations

Major Deviations

*Comments:*

#### **Success:**

Easily completed

Completed with difficulty or help

Not completed

*Comments:*

**Task Time:** \_\_\_\_\_ Seconds

#### **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 2: Change and display medication via CPOE**

*In Josiah's medication list you need to change the frequency of Cholecalciferol from "once a day" to "twice a day".*

**Optimal Path**

1. Click table row when the medication "Cholecalciferol (vitamin D3) Drops 400 unit/mL"
2. Click "EDIT" button
3. Change frequency to "Twice a day"
4. Click the "SAVE" button

Correct

Minor Deviations

Major Deviations

Comments:

**Success:**

Easily completed

Completed with difficulty or help

Not completed

Comments:

**Task Time:** \_\_\_\_\_ Seconds

**Observed Errors and Verbalizations:**

Comments:

**Rating:**

Overall, this task was:

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

**Administrator / Notetaker Comments:**

**Session 2: Medication List**

**TASK 1: Change and display active and historical medications on the medication list**

*In Josiah's medication list you need to change the status of Nystatin Suspension from "delivered" to "not needed".*

**Optimal Path**

1. Click the "Status" table cell for "Nystatin Suspension 100,000 unit/mL"
2. Change status from "Delivered" to "Not Needed"

Correct  
Minor Deviations  
Major Deviations  
*Comments:*

**Success:**  
Easily completed  
Completed with difficulty or help  
Not completed  
*Comments:*

**Task Time:** \_\_\_\_\_ Seconds

**Observed Errors and Verbalizations:**  
*Comments:*

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

**Administrator / Notetaker Comments:**

### **Session 3: Medication Allergy List**

#### **Task 1: Record a medication allergy**

*Add "Penicillin V Potassium" to Josiah's medication allergy list*

#### **Optimal Path**

1. *Click "NEW" button*
2. *Add "Penicillin V Potassium" to medication input field*
3. *Add "Penicillins" to the "Allergy Group" input field*
4. *Select "Allergy to Penicillin" from the "Problem" dropdown*
5. *Set the "Stages/Severity" to "Moderate to severe"*
6. *Click the SAVE button*

Correct  
Minor Deviations  
Major Deviations  
*Comments:*

**Success:**  
Easily completed  
Completed with difficulty or help  
Not completed  
*Comments:*

**Task Time:** \_\_\_\_\_ Seconds

**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 2: Change a medication allergy**

*Change the severity of Josiah's chest pain from "moderate to severe" to "severe".*

**Optimal Path**

1. *Click on the "Penicillin V Potassium" data table row*
2. *Click "EDIT" button*
3. *Change the "Stages/severity" from "Moderate to severe" to "Severe"*
4. *Click the "SAVE" button*

Correct

Minor Deviations

Major Deviations

*Comments:*

**Success:**

Easily completed

Completed with difficulty or help

Not completed

*Comments:*

**Task Time:** \_\_\_\_\_ Seconds

**Observed Errors and Verbalizations:**

*Comments:*

**Rating:**

Overall, this task was:

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

**Administrator / Notetaker Comments:**

**Session 4: Problem List**

**TASK 1: Record a problem to the problem list**

On Josiah's problem list add SEASONAL ALLERGIC RHINITIS

1. On the "Problem List" tab, click on the "NEW" button
2. Search for the problem "SEASONAL ALLERGIC RHINITIS"
3. Select "SEASONAL ALLERGIC RHINITIS" from the search and click the "SELECT" button
4. Click on the "Stage/Severity" dropdown and select "mild intermittent"
5. Click "SAVE" button

Correct

Minor Deviations

Major Deviations

Comments:

**Success:**

Easily completed

Completed with difficulty or help

Not completed

Comments:

Task Time: \_\_\_\_\_ Seconds

**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 2: Change a problem on the problem list**

On Josiah's problem list, change the stage/severity of seasonal allergic rhinitis from "mild intermittent" to "moderate persistent"

1. Select "SEASONAL ALLERGIC RHINITIS" on the problem list data table
2. Click on the "EDIT" button
3. Click on the "Stage/Severity" dropdown and change "milder intermittent" to "moderate persistent"
4. Click "SAVE" button

Correct

Minor Deviations

Major Deviations

Comments:

**Success:**

Easily completed

Completed with difficulty or help

Not completed

*Comments:*

**Task Time:** \_\_\_\_\_ Seconds

**Observed Errors and Verbalizations:**

*Comments:*

**Rating:**

Overall, this task was:

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

**Administrator / Notetaker Comments:**

**Session 5: CPOE Labs**

**TASK 1: Record Lab order via CPOE**

*Start a sore throat new encounter for Josiah and order an In-House STREP test*

**Optimal Path**

1. *From the ENCOUNTERS tab click on "NEW NOTE" button*
2. *Switch to ACCESS/PLAN tab*
3. *Select LAB tab*
4. *Click on the "CLICK HERE TO ORDER ANOTHER DIAGNOSTIC TEST" button*
5. *Click on the "Diagnostic Test Name" dropdown in the data table and search for "STREP AAG, EIA [In-House]"*
6. *Select "STREP AAG, EIA [In-House]" from the dropdown*
7. *Click on the "CREATE" button*
8. *Click "OK" on "Create task for diagnostic test" modal*

Correct

Minor Deviations

Major Deviations

*Comments:*

**Success:**

Easily completed

Completed with difficulty or help

Not completed

*Comments:*

**Task Time:** \_\_\_\_\_ Seconds

**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 2: Change and display lab order via CPOE**

Add another In-House lab, URINE SCREEN to the STREP test you just ordered

1. Select LAB tab
2. Click on the "CLICK HERE TO ORDER ANOTHER DIAGNOSTIC TEST" button
3. Click on the "Diagnostic Test Name" dropdown in the data table and search for "URINE SCREEN"
4. Select "URINE SCREEN" from the dropdown
5. Click on the "CREATE" button
6. Click "OK" on "Create task for diagnostic test" modal
7. Select "ALL" button from new order modal to keep both orders

Correct

Minor Deviations

Major Deviations

*Comments:*

**Success:**

Easily completed

Completed with difficulty or help

Not completed

*Comments:*

**Task Time:** \_\_\_\_\_ Seconds

**Observed Errors and Verbalizations:**

*Comments:*

**Rating:**

Overall, this task was:

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

**Administrator / Notetaker Comments:**

**Session 6: CPOE Diagnostic Imaging**

**TASK 1: Record Imaging order via CPOE**

Add a FOOT XRAY test to the encounter and update the order

1. Select LAB tab
2. Click on the "CLICK HERE TO ORDER ANOTHER DIAGNOSTIC TEST" button
3. Click on the "Diagnostic Test Name" dropdown in the data table and search for "FOOT XRAY"
4. Select "FOOT XRAY" from the dropdown
5. Click on the "CREATE" button
6. Click "OK" on "Create task for diagnostic test" modal

Correct

Minor Deviations

Major Deviations

Comments:

**Success:**

Easily completed

Completed with difficulty or help

Not completed

Comments:

**Task Time:** \_\_\_\_\_ Seconds

**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 2: Change and display imaging order via CPOE**

Change the FOOT XRAY order to an ANKLE XRAY and update the order

1. Select LAB tab

2. Click on the "Diagnostic Test Name" dropdown in the data table and change "FOOT XRAY" to "ANKLE XRAY"
3. Click on the "CREATE" button
4. Click "OK" on "Create task for diagnostic test" modal
5. Select "YES" to change the order

Correct

Minor Deviations

Major Deviations

*Comments:*

**Success:**

Easily completed

Completed with difficulty or help

Not completed

*Comments:*

**Task Time:** \_\_\_\_\_ Seconds

**Observed Errors and Verbalizations:**

*Comments:*

**Rating:**

Overall, this task was:

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

**Administrator / Notetaker Comments:**