



Wellsoft EDIS v11

Customized Common Industry Format Template
for Electronic Health Record Usability Testing

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Dates of Tests: May 14-31, 2018
Date of Report: June 18, 2018

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Executive Summary

A usability test of Wellsoft EDIS version 11, an ambulatory EHR was conducted virtually May 14-31, 2018 by Wellsoft Corporation. The purpose of this test was to evaluate 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 who matched the target demographic criteria were participants for each of the 13 tasks and used the EHRUT in simulated, but representative tasks.

This study collected performance data on 13 tasks typically conducted on an EHR:

1. Modify demographic data
2. Enter a new medication order
3. Modify a medication order
4. Enter a new lab order
5. Modify a lab order
6. Enter a new imaging order
7. Modify an imaging order
8. Enter a medication order and review drug-allergy interactions, including developer
9. Enter a medication order and review drug-drug interactions, including developer
10. Enter a new problem
11. Modify a problem
12. Enter a new medication allergy
13. Review vital signs to determine which are outside the normal range

During the 1-hour one-on-one usability test, each participant was greeted by the administrator and participants provided a recorded verbal agreement to participate in the study; participants could withdraw at any time. Some participants had prior experience with the EHR while some did not. The administrator introduced the test and instructed the participants to complete a series of tasks (given one at a time) using the EHRUT. During the testing, the administrator and data logger timed the test and recorded user performance data 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 comments
- 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 testing, participants completed a post-test questionnaire and were compensated \$100 for their time. Various recommended metrics, in accordance with the examples set forth in the *NIST Guide to the Processes Approach for Improving the Usability of Electronic Health Records*, were used to evaluate the usability of the EHRUT. Following is a summary of the performance and rating data collected on the EHRUT.

Measure	N	Task Success	Path Deviation	Task Time		Errors	Task Ratings (5=Easy)
				Mean (SD)	Deviations (Observed / Optimal)		
Task	#	Mean (SD)	Deviations (Observed / Optimal)	Mean (SD)	Deviations (Observed / Optimal)	Mean (SD)	Mean (SD)
Modify demographic data	10	100% 0%	1.07	71 44	1.58	0% 0%	4.3
Enter new med order	10	100% 0%	1.05	25 7	1.00	0% 0%	4.7
Modify med order	10	100% 0%	1.06	29 14	1.06	0% 0%	4.4
Enter new lab order	10	100% 0%	1.03	29 14	1.16	0% 0%	4.4
Modify lab order	10	100% 0%	1.00	29 16	1.09	0% 0%	4.6
Enter new imaging order	10	100% 0%	1.05	26 8	1.02	0% 0%	4.7
Modify imaging order	10	100% 0%	1.00	20 10	1.07	0% 0%	4.6
Enter med order and review drug-allergy interactions incl developer	10	100% 0%	1.02	42 14	1.05	0% 0%	4.6
Enter med order and review drug-drug interactions incl developer	10	100% 0%	1.00	33 13	1.10	0% 0%	4.4
Enter new problem	10	100% 0%	1.00	19 6	1.27	0% 0%	4.4
Modify problem	10	100% 0%	1.00	17 6	1.12	0% 0%	4.6
Enter new med allergy	10	100% 0%	1.00	14 5	1.14	0% 0%	4.9
Determine vitals outside normal range	10	100% 0%	1.00	11 3	1.05	0% 0%	4.8

The results from the System Usability Scale scored the subjective satisfaction with the system based on performance with these tasks to be 84.6.

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

Major Findings

Participants found the system to be user friendly, especially appreciating the ability to simply begin typing a medication order, allergy, problem, etc. and have the item quickly appear. Participants also identified that the EHRUT is well-organized with intuitively labeled tabs. Even those participants who had not previously used Wellsoft EDIS were able to navigate easily.

Areas for Improvement

Participants suggested that adding a clearer prompt on how to handle dropdown fields would have allowed them to more quickly adjust to using these types of fields.

Introduction

The EHRUT tested for this study was Wellsoft EDIS version 11. Designed to present medication information to healthcare providers in ambulatory/outpatient, Emergency Department and urgent care settings, the EHRUT is a comprehensive system with robust features designed to automate processes for increased efficiencies and patient throughput. The usability testing attempted to represent realistic exercises and conditions.

The purpose of the study was to test and validate the usability of the current user interface and provide evidence of usability in the EHRUT. To this end, measures of effectiveness, efficiency and user satisfaction, such as time to complete a task, deviations from the optimal path, and any noted errors, were captured during the usability testing.

Method

Participants

A total of 14 participants were tested on the EHRUT, though only 10 participants were used per task. Participants in the test were physicians, physician assistants, and nurses. Participants were recruited by Wellsoft and compensated \$100 for their time. In addition, participants had no direct connection to the development of or organization producing the EHRUT. Participants were not from the testing or supplier organization.

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	Educ	Occupation / Role	Prof Experience (months)	Computer Experience (months)	Product Experience (months)	Assistive Tech Needs
1	01	F	30-39	Bachelor degree	Dir of Pt Care Svcs	240	360	7	None
2	02	F	40-49	Master degree	Physician Assistant	213	336	7	None
3	03	M	50-59	Associate degree	Flight Nurse; RN	263	360	0	None
4	04	F	30-39	Bachelor degree	Critical Care Transport RN	192	192	0	None
5	05	M	40-49	Bachelor degree	Critical Care Transport RN	263	240	0	None
6	06	F	40-49	Bachelor degree	Registered Nurse	168	144	2	None
7	07	F	40-49	Bachelor degree	Registered Nurse	295	295	60	None
8	08	M	40-49	Doctorate degree	Attending Physician	202	360	30	None
9	09	F	60-69	Associate degree	Clinical System Analyst; RN	540	300	84	None
10	10	F	30-39	Bachelor degree	Registered Nurse	36	240	12	None
11	11	F	50-59	Bachelor degree	Operations Lead; RN	175	125	125	None
12	12	F	40-49	Bachelor degree	Registered Nurse	311	240	0	None
13	13	F	60-69	Associate degree	Clinical Applications Analyst; RN	492	300	131	None

	Part ID	Gender	Age	Educ	Occupation / Role	Prof Experience (months)	Computer Experience (months)	Product Experience (months)	Assistive Tech Needs
14	14	M	60-69	Associate degree	Medical Analyst; RN	432	300	60	None

All fourteen participants (matching the demographics in the section on Participants) were recruited and participated in the usability test. Participants were scheduled for one-hour sessions, which included time for a debrief by the administrator and data logger.

Study Design

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

During the usability test, participants interacted with one EHR. Each participant used the system in the same location (remotely) 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 comments
- Participant’s satisfaction ratings of the system

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

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:

1. Modify demographic data

2. Enter a new medication order
3. Modify a medication order
4. Enter a new lab order
5. Modify a lab order
6. Enter a new imaging order
7. Modify an imaging order
8. Enter a medication order and review drug-allergy interactions, including developer
9. Enter a medication order and review drug-drug interactions, including developer
10. Enter a new problem
11. Modify a problem
12. Enter a new medication allergy
13. Review vital signs to determine which are outside the normal range

Tasks were selected based on their frequency of use, criticality of function, and relation to the ONC 2015 Edition Certification criteria that were part of this usability study.

Procedures

Test participants were scheduled for one-hour sessions and arrived as individual participants. Each participant was assigned a number to identify results while detaching the identity of the individual from the response and observations. Demographic data was collected from each participant.

To ensure that the test ran smoothly, two staff members participated in this test, the usability administrator and data logger with a combined usability experience of 22 years, both with master's degrees.

The administrator moderated each test including administering instructions and tasks. The administrator also monitored path deviations and task success, obtained post-task rating data, and took notes on participant comments. The data logger monitored task times and took notes on number and types of errors.

Participants were instructed to perform the tasks as quickly as possible, making as few errors and deviations as possible, and without assistance.

Each participant was provided with a clinical scenario providing the background context for the task workflows. Each participant was read the scenario and then provided instructions on the task to perform. Task timing began once the administrator finished reading the question. The task time was stopped once the participant successfully completed the task. Scoring is discussed below.

Following the session, the administrator gave the participant the post-test questionnaire (see Appendix D), provided instructions on how compensation for their time would occur, and thanked each individual for their participation.

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

Test Location

Remote desktop testing was conducted on a remote desktop using a screen sharing application. Only one participant at a time was logged into the session with the administrator and data logger, with a unique session ID utilized to ensure privacy.

Test Environment

The EHRUT would typically be used in a healthcare facility. The test application was running on a private server using a test database on a LAN connection. The participants used a mouse and keyboard when interacting with the EHR.

The application was set up by Wellsoft Corporation to mimic a live environment. Technically, the system performance (i.e. response time) was representative to what actual users would experience in a field implementation. Additionally, participants were not allowed to change any of the default system settings.

Test Forms and Tools

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

- a. Demographics Questionnaire
- b. Participant Briefing/Debriefing document
- c. Usability Task Tracking document
- d. Post-Test Questionnaire
- e. System Usability Scale

Examples of these documents can be found in Appendices A-E respectively.

The participant's interaction with the EHRUT was captured and recorded digitally with web conferencing software running on the test machine. The administrator and data logger participated in each session live, with access to the recorded session afterwards.

Participant Instructions

The administrator read the following instructions aloud to each participant (also see the full Participant Briefing/Debriefing document in Appendix B):

Thank you for participating in this study. Our session today will last no more than 1 hour. During that time, I'll ask you to interact with an electronic health record system called Wellsoft EDIS version 11.

I will ask you to complete some tasks using this system. Keep in mind that we are testing the system, not you or your abilities. Our goal in this testing is to understand how easy (or how difficult) this system is to use, what steps you use to accomplish the goals, and your subjective impressions. Please complete the tasks as quickly as you can without sacrificing accuracy and only complete the assigned tasks. While we would like to know when you are having difficulty with the system, I may not be able to address your questions immediately during the task. Should you have extreme difficulty in completing a task, I may move us on without finishing that portion. Please save your detailed comments until the end of the session as a whole when we can discuss freely.

We are recording the session today using Join.Me. All of the information that you provide will be kept confidential and will be de-identified for analysis purposes. Recording the session allows me to focus more on talking with you and less on taking notes because I can review the recording later, if necessary. My colleague, Dwight, is also watching this session to assist me in taking notes. If for any reason you are unwilling to participate in the recorded session, you may exit at this time. Should you feel it necessary, you are also able to withdraw at any time during the testing.

Do you have any questions or concerns? If none, please verbally confirm your consent to participate in today's usability study.

Following the procedural instructions, participants were shown the EHR and then provided with the following instructions by the administrator:

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

Participants were given 13 tasks to complete. Tasks are listed in the Usability Task Tracking document in Appendix C.

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

Data Scoring

The following table (Table 1) details how tasks were scored, errors evaluated, and the time data analyzed.

Measures	Rationale and Scoring
<p>Effectiveness: 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 20 seconds, then the allotted task time performance was 25 seconds (20 seconds x 1.25). The ratio should be aggregated across tasks and reported with mean and variance scores.</p>
<p>Effectiveness: Task Failures</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 Failure. 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. 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>

Measures	Rationale and Scoring
<p>Efficiency:</p> <p>Task Deviations</p>	<p>The participant’s path (i.e. steps) through the application was recorded.</p> <p>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 deviations be reported. Optimal paths (i.e. procedural steps) should be recorded when constructing tasks.</p>
<p>Efficiency:</p> <p>Task Time</p>	<p>Each task was timed from when the administrator said “Begin” until the participant successfully completed 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>Satisfaction:</p> <p>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>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 Wellsoft EDIS overall, the testing team administered the System Usability Scale (SUS) post-test questionnaire. See full SUS questionnaire in Appendix E.</p>

Table 1. Details of how observed data were scored.

Results

Data Analysis and Reporting

The results of the usability test were calculated according to the methods specified in the Usability Metrics section above. There were no participants who failed to follow session and task instructions.

The usability testing results for the EHRUT are detailed below (see Table 2). The results should be seen in light of the objectives and goals outlined in the Study Design section. The data should yield actionable results that, if corrected, yield material, positive impact on user performance.

Measure	N	Task Success	Path Deviation	Task Time		Errors	Task Ratings (5=Easy)
Task	#	Mean (SD)	Deviations (Observed / Optimal)	Mean (SD)	Deviations (Observed / Optimal)	Mean (SD)	Mean (SD)
Modify demographic data	10	100% 0%	1.07	71 44	1.58	0% 0%	4.3
Enter new med order	10	100% 0%	1.05	25 7	1.00	0% 0%	4.7
Modify med order	10	100% 0%	1.06	29 14	1.06	0% 0%	4.4
Enter new lab order	10	100% 0%	1.03	29 14	1.16	0% 0%	4.4
Modify lab order	10	100% 0%	1.00	29 16	1.09	0% 0%	4.6
Enter new imaging order	10	100% 0%	1.05	26 8	1.02	0% 0%	4.7
Modify imaging order	10	100% 0%	1.00	20 10	1.07	0% 0%	4.6
Enter med order and review drug-allergy interactions incl developer	10	100% 0%	1.02	42 14	1.05	0% 0%	4.6
Enter med order and review drug-drug interactions incl developer	10	100% 0%	1.00	33 13	1.10	0% 0%	4.4
Enter new problem	10	100% 0%	1.00	19 6	1.27	0% 0%	4.4
Modify problem	10	100% 0%	1.00	17 6	1.12	0% 0%	4.6
Enter new med allergy	10	100% 0%	1.00	14 5	1.14	0% 0%	4.9
Determine vitals outside normal range	10	100% 0%	1.00	11 3	1.05	0% 0%	4.8

Table 2. Usability metrics

The results from the SUS scored the subjective satisfaction with the system based on performance with these tasks to be 84.6. Broadly interpreted, scores under 60 represent systems with poor usability; scores over 80 would be considered above average.

Discussion of the Findings

Effectiveness

Based on the success, failure and path deviation data, the system was laid out logically with the only confusion stemming from how to activate fields with dropdown options. There were no major path deviations that caused a participant to be incapable of completing a task. The participants were able to effectively use the system to complete each task.

Efficiency

Efficiency was measured as a function of time on task relative to pre-determined benchmark task times and clicks per task relative to benchmark task values. Based on the task completion times, the majority of users completed all tasks close to the optimal time.

Satisfaction

Based on the task ratings, all the users found the tasks to be easy to very easy. The SUS score was calculated to be 84.6, with the lowest score being 47.5 and the highest score being 100. Over 71% of the participants scored Wellsoft EDIS in the 80+ category for SUS, with 57% of participants scoring Wellsoft EDIS in the 90+ category for SUS.

Major Findings

Participants found the system to be user friendly, especially appreciating the ability to simply begin typing a medication order, allergy, problem, etc. and have the item quickly appear. Participants also identified that the EHRUT is well-organized with intuitively labeled tabs. Even those participants who had not previously used Wellsoft EDIS were able to navigate easily.

Areas for Improvement

Participants suggested that adding a clearer prompt on how to handle dropdown fields would have allowed them to more quickly adjust to using these types of fields.

Appendices

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

- a. Demographics Questionnaire
- b. Participant Briefing/Debriefing document
- c. Usability Task Tracking document
- d. Post-Test Questionnaire
- e. System Usability Scale

Appendix A: Demographics Questionnaire

Name	Click or tap here to enter text.
Gender	Choose an item.
Age	Choose an item.
Education; highest attained	Choose an item.
Title	Click or tap here to enter text.
Professional Experience in years/months (e.g. 2 years, 3 months)	Click or tap here to enter text.
Experience with computers in years/months (e.g. 10 years, 10 months)	Click or tap here to enter text.
Experience with Wellsoft EDIS in years/months (e.g. 5 years, 1 month)	Click or tap here to enter text.

Appendix B: Participant Briefing/Debriefing

Consent

This remote session is being recorded using Join.Me software. All the information that you provide will be kept confidential and will be de-identified for analysis purposes. If for any reason you are unwilling to participate in the recorded session, you may exit at this time. Your participation is entirely voluntary and you are free to end our session at any time.

Introduction

Thank you for participating in this study. Our session today will last no more than 1 hour. During that time, I'll ask you to interact with an electronic health record system called Wellsoft EDIS version 11.

I will ask you to complete some tasks using this system. Keep in mind that we are testing the system, not you or your abilities. Our goal in this testing is to understand how easy (or how difficult) this system is to use, what steps you use to accomplish the goals, and your subjective impressions. Please complete the tasks as quickly as you can without sacrificing accuracy and only complete the assigned tasks. While we would like to know when you are having difficulty with the system, I may not be able to address your questions immediately during the task. Should you have extreme difficulty in completing a task, I may move us on without finishing that portion. Please save your detailed comments until the end of the session as a whole when we can discuss freely.

We are recording the session today using Join.Me. All of the information that you provide will be kept confidential and will be de-identified for analysis purposes. Recording the session allows me to focus more on talking with you and less on taking notes because I can review the recording later, if necessary. My colleague, Dwight, is also watching this session to assist me in taking notes. If for any reason you are unwilling to participate in the recorded session, you may exit at this time. Should you feel it necessary, you are also able to withdraw at any time during the testing.

Do you have any questions or concerns? If none, please verbally confirm your consent to participate in today's usability study.

Debriefing

We've concluded the task portion of our study. Next, I'd like to ask you a few subjective questions on your experience.

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

Administer SUS

Exit

Thank you again for your participation today. I will follow up via email with instructions on how you will receive the honorarium.

Appendix C: Usability Task Tracking

Task 1: Review, then modify patient's date of birth and sexual orientation

Take the participant to the starting point for the task. Begin timer.

During the admission process, the patient's demographic data was entered. Review the demographics and change date of birth and sexual orientation. You may select any date of birth or sexual orientation.

Record Success:

_____ Completed according to proper steps.
_____ Completed with difficulty or help. Describe below in comments.
_____ Not completed.
Comments:

Task Time Observed:

_____ Seconds

Task Time Optimal:

_____ Seconds

Optimal Path:

Open patient record → double click on Age/DOB field → Enter DOB → Enter → double click on Sexual Orientation field → Select Sexual Orientation → Enter

_____ Correct
_____ Minor Deviations/Cycle (describe below)
_____ Major Deviations (describe below)

Comments:

Observed Errors and Verbalizations:

Rating: (1) Very Easy (2) Easy (3) Moderate (4) Difficult (5) Very Difficult

_____ Overall, how would you rate this task?

Associated Criteria:

- 170.315(a)(5) Demographics

Task 2: Enter a new medication order

Take the participant to the starting point for the task. Begin timer.

Create a new medication order of *simvastatin 20 mg tablet, by mouth once daily*.

Record Success:

_____ Completed according to proper steps.
_____ Completed with difficulty or help. Describe below in comments.
_____ Not completed.

Comments:

Task Time Observed:

_____ Seconds

Task Time Optimal:

_____ Seconds

Optimal Path:

Click Orders button → Type medication name → Enter → Ok

_____ Correct
_____ Minor Deviations/Cycle (describe below)
_____ Major Deviations (describe below)

Comments:

Observed Errors and Verbalizations:

Rating: (1) Very Easy (2) Easy (3) Moderate (4) Difficult (5) Very Difficult

_____ Overall, how would you rate this task?

Associated Criteria:

- 170.315(a)(1) CPOE – Medications
- 170.315(a)(7) Medication List

Task 3: Modify a medication order

Take the participant to the starting point for the task. Begin timer.

Modify the medication order to **atorvastatin 20 mg tablet, by mouth once daily**.

Record Success:

_____ Completed according to proper steps.
_____ Completed with difficulty or help. Describe below in comments.
_____ Not completed.

Comments:

Task Time Observed:

_____ Seconds

Task Time Optimal:

_____ Seconds

Optimal Path:

Click Orders button → Click on Simvastatin order → Type medication name → Enter → Ok

_____ Correct
_____ Minor Deviations/Cycle (describe below)
_____ Major Deviations (describe below)

Comments:

Observed Errors and Verbalizations:

Rating: (1) Very Easy (2) Easy (3) Moderate (4) Difficult (5) Very Difficult

_____ Overall, how would you rate this task?

Associated Criteria:

- 170.315(a)(1) CPOE – Medications
- 170.315(a)(7) Medication List

Task 4: Enter a new lab order, including reason for order

Take the participant to the starting point for the task. Begin timer.

Create a new lab order for **cholesterol in HDL** with an indication of **hypercholesterolemia**.

Record Success:

_____ Completed according to proper steps.
_____ Completed with difficulty or help. Describe below in comments.
_____ Not completed.
Comments:

Task Time Observed:

_____ Seconds

Task Time Optimal:

_____ Seconds

Optimal Path:

Click Orders button → Type lab name → Enter → Ok

_____ Correct
_____ Minor Deviations/Cycle (describe below)
_____ Major Deviations (describe below)

Comments:

Observed Errors and Verbalizations:

Rating: (1) Very Easy (2) Easy (3) Moderate (4) Difficult (5) Very Difficult

_____ Overall, how would you rate this task?

Associated Criteria:

- 170.315(a)(2) CPOE - Laboratory

Task 5: Modify a lab order, including reason for order

Take the participant to the starting point for the task. Begin timer.

Modify the lab order to **cholesterol level** with an indication of **hypercholesterolemia**.

Record Success:

- _____ Completed according to proper steps.
- _____ Completed with difficulty or help. Describe below in comments.
- _____ Not completed.

Comments:

Task Time Observed:

_____ Seconds

Task Time Optimal:

_____ Seconds

Optimal Path:

Click Orders button → Click on Cholesterol in HDL order → Type lab name → Enter → Ok

- _____ Correct
- _____ Minor Deviations/Cycle (describe below)
- _____ Major Deviations (describe below)

Comments:

Observed Errors and Verbalizations:

Rating: (1) Very Easy (2) Easy (3) Moderate (4) Difficult (5) Very Difficult

_____ Overall, how would you rate this task?

Associated Criteria:

- 170.315(a)(2) CPOE - Laboratory

Task 6: Enter a new imaging order, including reason for order

Take the participant to the starting point for the task. Begin timer.

*Create a new imaging order for **CT head/brain without IV contrast** with an indication of **cerebrovascular accident**.*

Record Success:

- _____ Completed according to proper steps.
- _____ Completed with difficulty or help. Describe below in comments.
- _____ Not completed.

Comments:

Task Time Observed:

_____ Seconds

Task Time Optimal:

_____ Seconds

Optimal Path:

Click Orders button → Type imaging name → Enter → Ok

- _____ Correct
- _____ Minor Deviations/Cycle (describe below)
- _____ Major Deviations (describe below)

Comments:

Observed Errors and Verbalizations:

Rating: (1) Very Easy (2) Easy (3) Moderate (4) Difficult (5) Very Difficult

_____ Overall, how would you rate this task?

Associated Criteria:

- 170.315(a)(3) CPOE – Diagnostic Imaging

Task 7: Modify an imaging order, including reason for order

Take the participant to the starting point for the task. Begin timer.

*Modify the imaging order to **CT head/brain with IV contrast** with an indication of **cerebrovascular accident**.*

Record Success:

_____ Completed according to proper steps.
_____ Completed with difficulty or help. Describe below in comments.
_____ Not completed.

Comments:

Task Time Observed:

_____ Seconds

Task Time Optimal:

_____ Seconds

Optimal Path:

Click Orders button → Click on CT head/brain without contrast order → Type imaging name → Enter → Ok

_____ Correct
_____ Minor Deviations/Cycle (describe below)
_____ Major Deviations (describe below)

Comments:

Observed Errors and Verbalizations:

Rating: (1) Very Easy (2) Easy (3) Moderate (4) Difficult (5) Very Difficult

_____ Overall, how would you rate this task?

Associated Criteria:

- 170.315(a)(3) CPOE – Diagnostic Imaging

Task 8: Enter a new medication order and review drug-allergy interactions, including developer

Take the participant to the starting point for the task. Begin timer.

*Review the patient's medication allergies. Attempt to enter a medication order for **Bactrim 800 mg tablet** and review the drug-allergy interaction including the developer information.*

Record Success:

- _____ Completed according to proper steps.
- _____ Completed with difficulty or help. Describe below in comments.
- _____ Not completed.

Comments:

Task Time Observed:

_____ Seconds

Task Time Optimal:

_____ Seconds

Optimal Path:

Click Orders button → Type medication name → Enter → Ok → Submit Orders

- _____ Correct
- _____ Minor Deviations/Cycle (describe below)
- _____ Major Deviations (describe below)

Comments:

Observed Errors and Verbalizations:

Rating: (1) Very Easy (2) Easy (3) Moderate (4) Difficult (5) Very Difficult

_____ Overall, how would you rate this task?

Associated Criteria:

- 170.315(a)(1) CPOE – Medications
- 170.315(a)(4) Drug-Drug, Drug-Allergy Interaction Checking
- 170.315(a)(7) Medication List
- 170.315(a)(9) Clinical Decision Support

Task 9: Enter a new medication order and review drug-drug interactions, including developer

Take the participant to the starting point for the task. Begin timer.

*Attempt to enter a medication order for **Losartan 50 mg tablet** and review the drug-drug interaction including the developer information.*

Record Success:

- _____ Completed according to proper steps.
- _____ Completed with difficulty or help. Describe below in comments.
- _____ Not completed.

Comments:

Task Time Observed:

_____ Seconds

Task Time Optimal:

_____ Seconds

Optimal Path:

Click Orders button → Type medication name → Enter → Ok → Submit Orders

- _____ Correct
- _____ Minor Deviations/Cycle (describe below)
- _____ Major Deviations (describe below)

Comments:

Observed Errors and Verbalizations:

Rating: (1) Very Easy (2) Easy (3) Moderate (4) Difficult (5) Very Difficult

_____ Overall, how would you rate this task?

Associated Criteria:

- 170.315(a)(1) CPOE – Medications
- 170.315(a)(4) Drug-Drug, Drug-Allergy Interaction Checking
- 170.315(a)(7) Medication List
- 170.315(a)(9) Clinical Decision Support

Task 10: Enter a new problem

Take the participant to the starting point for the task. Begin timer.

Enter a new problem for the patient of **atrial fibrillation**.

Record Success:

_____ Completed according to proper steps.
_____ Completed with difficulty or help. Describe below in comments.
_____ Not completed.

Comments:

Task Time Observed:

_____ Seconds

Task Time Optimal:

_____ Seconds

Optimal Path:

Click on the PMH field or Diagnosis tab → Type Atrial Fibrillation → Enter

_____ Correct
_____ Minor Deviations/Cycle (describe below)
_____ Major Deviations (describe below)

Comments:

Observed Errors and Verbalizations:

Rating: (1) Very Easy (2) Easy (3) Moderate (4) Difficult (5) Very Difficult

_____ Overall, how would you rate this task?

Associated Criteria:

- 170.315(a)(6) Problem List

Task 11: Change a problem

Take the participant to the starting point for the task. Begin timer.

Modify the problem of *atrial fibrillation* to *chronic atrial fibrillation*.

Record Success:

_____ Completed according to proper steps.
_____ Completed with difficulty or help. Describe below in comments.
_____ Not completed.

Comments:

Task Time Observed:

_____ Seconds

Task Time Optimal:

_____ Seconds

Optimal Path:

Click on the PMH field or Diagnosis tab → Click on Atrial Fibrillation → Type new problem → Enter

_____ Correct
_____ Minor Deviations/Cycle (describe below)
_____ Major Deviations (describe below)

Comments:

Observed Errors and Verbalizations:

Rating: (1) Very Easy (2) Easy (3) Moderate (4) Difficult (5) Very Difficult

_____ Overall, how would you rate this task?

Associated Criteria:

- 170.315(a)(6) Problem List

Task 12: Enter a new medication allergy

Take the participant to the starting point for the task. Begin timer.

Enter a new medication allergy for the patient of codeine.

Record Success:

- _____ Completed according to proper steps.
- _____ Completed with difficulty or help. Describe below in comments.
- _____ Not completed.

Comments:

Task Time Observed:

_____ Seconds

Task Time Optimal:

_____ Seconds

Optimal Path:

Click on the Allergies field → Type Codeine → Enter

- _____ Correct
- _____ Minor Deviations/Cycle (describe below)
- _____ Major Deviations (describe below)

Comments:

Observed Errors and Verbalizations:

Rating: (1) Very Easy (2) Easy (3) Moderate (4) Difficult (5) Very Difficult

_____ Overall, how would you rate this task?

Associated Criteria:

- 170.315(a)(8) Medication Allergy List

Task 13: Review vital signs to determine which are outside of normal range

Take the participant to the starting point for the task. Begin timer.

Review the patient's vital signs and verbally confirm which are outside of the normal range.

Record Success:

_____ Completed according to proper steps.
_____ Completed with difficulty or help. Describe below in comments.
_____ Not completed.

Comments:

Task Time Observed:

_____ Seconds

Task Time Optimal:

_____ Seconds

Optimal Path:

Click on the VS field → View and verbally confirm that Pulse is outside normal range

_____ Correct
_____ Minor Deviations/Cycle (describe below)
_____ Major Deviations (describe below)

Comments:

Observed Errors and Verbalizations:

Rating: (1) Very Easy (2) Easy (3) Moderate (4) Difficult (5) Very Difficult

_____ Overall, how would you rate this task?

Associated Criteria:

- 170.315(a)(9) Clinical Decision Support

Appendix D: Post-Test Questionnaire

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

Appendix E: System Usability Scale

Ratings:

(5) Strongly Agree (4) Agree (3) Neutral (2) Disagree (1) Strongly Disagree

Choose an item.	I think that I would like to use this system frequently.
Choose an item.	I found the system unnecessarily complex.
Choose an item.	I thought the system was easy to use.
Choose an item.	I think that I would need the support of a technical person to be able to use this system.
Choose an item.	I found the various functions in this system were well integrated.
Choose an item.	I thought there was too much inconsistency in this system.
Choose an item.	I would imagine that most people would learn to use this system very quickly.
Choose an item.	I found the system very cumbersome to use.
Choose an item.	I felt very confident using the system.
Choose an item.	I would need to learn a lot of things before I could get going with this system.