EHR Usability Test Report of **CareCloud Charts 2.2**

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

CareCloud Charts 2.2
Date of Usability Test: December 2018
Date of Report: 12/10
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Executive Summary

A usability test of CareCloud Charts 2.2, an Ambulatory EHR was conducted in December 2018 remotely by CareCloud. The purpose of this test was to test and validate the usability of the current user interface, and provide evidence of usability of CareCloud and provide quantitative analysis of the system's usability.

During the usability test, 10 healthcare providers and Nurse Practitioners matching the target demographic criteria and representing a cross section of our typical user base, served as participants and used CareCloud in simulated, but representative tasks.

This study collected performance data on a series of tasks related to safety-enhanced design, typically conducted on an EHR. The tasks are correlated to the certificate criteria in 45 CFR Part

170 Subpart C of the Health Information Technology: 2015 Edition Health Information Technology (Health IT) Certification Criteria, 2015 Edition Base Electronic Health Record (EHR) Definition and ONC Health IT Certification Program Modifications:

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

Tasks were created with the goal of completion within the shortest time and in accordance with ONC test criteria. Some obligatory steps about functionality of the software are not included in test steps during the completion of tasks. For example, in a task about prescription, it is assumed that the procedures such as registration of patient, creation of protocol for patient by the system, payment to pay desk, etc. are completed successfully.
Tasks created below do not include the tasks that calculate numerical measurements of this report and do not contain all scenarios of the tasks. For example, opening of allergy data list is not included as a step in recording and re-arrangement of allergic warnings. But, exact time of opening allergy data list and number of steps taken until this action are recorded for the completion of task successfully in terms of numerical measurements.

Participant Orientation

The participants were given instructions before the initiation of the test. The participants had prior experience with the CareCloud modules which they frequently use in the healthcare institutions they are employed. Therefore, they were not required to be given an extensive training about computer use and the software.

During the 60 minute one-on-one usability test, each participant was greeted by the administrator and asked to review and sign an informed consent/release form (included in Appendix 3); they were instructed that they could withdraw at any time. Participants had prior experience with CareCloud.

The administrator introduced the test, and instructed participants to complete a series of tasks (given one at a time) using the CareCloud Charts. During the testing, the administrator recorded user performance data electronically via live screen sharing. These recordings were analyzed to record the time it took to perform each task as well asses any deviations. The administrator did not give the participant assistance in how to complete the task. The participants were also told that they can follow test instructions mentioned in Section 3.4.

During the testing, the administrator timed the test and, recorded user performance data on paper and electronically. After each task, they entered the percentage of Task Success. The administrator did not give the participants assistance in how to complete any of the tasks.

Various recommended metrics, in accordance with the examples set forth in the NIST 7742 Customized Common Industry Format Template for Improving the Usability of Electronic Health Records were used to evaluate the usability of CareCloud. Participant screens and audio were recorded for subsequent analysis. The following types of data were collected for each participant:

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

All participant data was de-identified – no correspondence could be made from the identity of the participant to the data collected.

Following the conclusion of the testing, participants were asked to complete a post-test questionnaire and were not compensated for their time. The participants conducted this test out of the goodness of their hearts and to improve the system they are using to increase their day to day work efficiency. 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 CareCloud Charts. In addition to the performance data, the following qualitative observations were made:

- Test comments after the test
- Major findings
- Areas for improvement

Following is a summary of the performance and rating data collected on CareCloud Charts.

Data Summary

The summary of the performance and rating data collected during the Electronic Health Record Usability Testing (EHRUT) on the Table 1.1.

	Measure							
	N	Task Success	Path Deviation	Task Time (Seconds)		Errors	Scenario Ratings (5=Easy)	Risk Scale
Task	#	Percent (%)	Deviations (Observed / Optimal)	Mean (SD)	Deviations (Observed / Optimal)	Percent (%)	Mean (SD)	(1 = least risky, 5 = most risky)
CPOE Medications								

Task A1.1: Record CPOE Medication Order	10	98.0	7.4/7.0	168.7 (59.4)	88.7/80.0	2.0	NA	3
Task A1.2: Change CPOE Medication Order	10	100.0	4.7/2.0	41.2 (17.8)	26.2/15.0	0.0	NA	2
Task A1.3: Access CPOE Medication Order	10	100.0	3.0/3.0	74.8 (58.2)	64.8/10.0	0.0	NA	1
CPOE - Laboratory								
Task A2.1: Record Lab order via CPOE	10	97.5	7.0/7.0	263.3 (161.7)	198.3/65.0	2.5	NA	3
Task A2.2: Change Lab order via CPOE	10	98.8	8.0/8.0	119.6 (103.1)	69.6/50.0	1.3	NA	2
Task A2.3: Display changed CPOE Lab order	10	90.0	1.0/1.0	1.0 (0.3)	0/1.0	10.0	NA	4
CPOE - Imaging								
Task A3.1: Record Imaging order via CPOE	10	96.5	7.5/7.0	90.4 (45)	60.4/30.0	3.5	NA	3
Task A3.2: Change Imaging order via CPOE	10	90.0	7.0/7.0	51.7 (40.3)	31.7/20.0	10.0	NA	4
Task A3.3: Display changed CPOE Imaging order	10	90.0	1.0/1.0	1.0 (0.3)	0/1.0	10.0	NA	4

Drug-Drug, Drug-Allergy Interaction Checks								
Task A4.1: Using CPOE, trigger a drug-drug interaction by entering a new medication order	10	100.0	8.0/8.0	52.9 (16.6)	27.9/25.0	0.0	NA	1
Task A4.2: Using CPOE, trigger a drug-allergy interaction by entering a new medication order	10	100.0	6.0/6.0	79.5 (36.5)	44.5/35.0	0.0	NA	1
Task A4.3: Adjust the severity level of a displayed drug-drug interaction	10	100.0	7.0/7.0	129.1 (103.2)	111.1/18.0	0.0	NA	1
Demographics								
Task A5.1: Record a patient's preferred language, date of birth, birth sex, race, ethnicity, sexual orientation, gender identity, preliminary cause of death (inpatient only), and preliminary date of death (inpatient only)	10	89.0	12.8/14.0	245.0 (92.3)	85.0/160.0	11.0	NA	4
Task A5.2: Change the patient's preferred language, date of birth, birth sex, race, ethnicity, sexual orientation, gender identity, preliminary cause of death (inpatient only), and preliminary date of death (inpatient only)	10	96.5	12.5/13.0	185.9 (59.8)	65.9/120.0	1.0	NA	2

Task A5.3: Display the patient's changed preferred language, date of birth, birth sex, race, ethnicity, sexual orientation, gender identity, preliminary cause of death (inpatient only), and preliminary date of death (inpatient only)	10	100.0	1.0/1.0	22.1 (52.1)	20.1/2.0	0.0	NA	1
Problem List								
Task A6.1: Record a problem to the problem list	10	98.0	5.6/5.0	60.0 (30.4)	40.0/20.0	2.0	NA	2
Task A6.2: Change a problem on the problem list	10	100.0	6.1/6.0	54.5 (24.8)	34.5/20.0	0.0	NA	1
Task A6.3: Display the active problem list	10	100.0	2.0/2.0	25.3 (19.8)	15.3/10.0	0.0	NA	1
Task A6.4: Display the historical problem list	10	100.0	2.0/2.0	1.0 (0)	0/1.0	0.0	NA	1
Medication List								
Task A7.1: Record a medication to the medication list	10	100.0	6.0/6.0	64.7 (36.4)	49.7/15.0	0.0	NA	1
Task A7.2: Change a medication on the medication list	10	100.0	9.0/9.0	91.7 (45.5)	54.7/37.0	0.0	NA	1

Task A7.3: Display the active medication list	10	100.0	2.6/2.0	33.5 (27.8)	25.5/8.0	0.0	NA	1
Task A7.4: Display the historical medication list	10	100.0	2.5/2.0	4.4 (8.4)	3.4/1.0	0.0	NA	1
Medication Allergy List								
Task A8.1: Record a medication allergy	10	100.0	6.0/6.0	61.6 (22.9)	26.6/35.0	0.0	NA	1
Task A8.2: Change a medication allergy	10	99.0	9.4/9.0	83.5 (69.2)	55.5/28.0	1.0	NA	2
Task A8.3: Display the active medication allergy list	10	100.0	2.0/2.0	31.8 (22.6)	21.8/10.0	0.0	NA	1
TASK A8.4: Display the historical medication allergy list	10	100.0	2.0/2.0	1.0 (0)	0/1.0	0.0	NA	1
Clinical Decision Support								
Task A9.1, A9.2, A9.3: Add a CDS intervention and/or reference resource for each of the required elements: Problem List, Medication List, Medication Allergy List, at least one Demographic, Laboratory Test, Vital Signs, and a Combination of at least 2 of the elements above	10	99.0	11.0/11.0	163.8 (72.0)	88.8/75.0	1.0	NA	1

Task A9.4, A9.5, A9.7: Trigger the CDS interventions/resources added using the applicable data elements from each of the required elements	10	90.0	11.7/13.0	164.8 (88.5)	75.8/89.0	10.0	NA	4
Task A9.6: View the intervention/resource information using the Infobutton standard for data elements in the problem list, medication list, and demographics	10	65.6	8.5/8.0	398.8 (309.0)	368.8/30.0	31.0	NA	5
Task A9.8, A9.9, A9.10: Trigger the CDS interventions/resources based on data elements in the problem list, medication list, and medication allergy list by incorporating patient information from a transition of care/referral summary	10	87.5	9.9/11.0	102.1 (47.0)	28.1/74.0	12.5	NA	4
Task A9.11, A9.12, A9.13: Access the following attributes for one of the triggered CDS interventions/resources: bibliographic citation, developer, funding source, release/revision date	10	85.0	7.6/9.0	175.4 (77.5)	35.4/140.0	15.0	NA	4
Implantable Device List								
Task A14.1: Record UDI	10	85.0	7.7/9.0	367.8 (240)	202.8/165.0	15.0	NA	4

Task A14.2: Change UDI Status	10	78.0	4.3/4.0	38.2 (30.5)	23.2/15.0	22.0	NA	5
Task A14.3: Access UDI, Device Description, Identifiers and Attributes	10	79.0	3.1/4.0	20.7 (23.2)	10.7/10.0	21.0	NA	5
Clinical Information Reconciliation and Incorporation								
Task B2.1: Incorporate a CCDA and conduct reconciliation of the medications, medication allergies, and problems in the CCDA with the information currently in the patient's record	10	80.0	9.8/10.0	168.8 (76.2)	80.8/88.0	20.0	NA	5
Task B2.2: Generate a new CCDA with reconciled data	10	80.0	3.8/4.0	81.8 (41.3)	54.8/27.0	20.0	NA	5
e-Prescribe								
Task B3.1: E-prescribe New Prescription	10	90.0	5.7/6.0	148.5 (103.1)	98.5/50.0	10	NA	4
Task B3.2: Change Prescription (dosage or duration)	10	84.0	5.0/5.0	86.6 (54.6)	62.6/24.0	16	NA	4
Task B3.3: Cancel Prescription	10	85.0	7.8/8.0	140.4 (79.3)	80.4/60.0	15	NA	4
Task B3.4: Refill Prescription	10	90.0	4.8/5.0	48.2 (16.9)	18.2/30.0	10.0	NA	4

Task B3.5: Receive Fill Status Notification	10	85.0	12.5/13.0	220.9 (211.6)	208.9/12.0	15.0	NA	4
Task B3.6: Request and Receive Medication History Information	10	100.0	6.0/6.0	78.0 (76.1)	74.0/4.0	0.0	NA	1

Table 1.1: Test Result Summary

Introduction

CareCloud Version 2.2. CareCloud is an ambulatory electronic health record system, consisting of procedures such as medical monitoring of patients at the clinical level; operation of all medical and administrative modules in one software; processing, reporting, financial monitoring of a health record and its submission to integrated software and devices in a safety ensured environment.

This Usability test consists of the real scenarios typically used by CareCloud users. The purpose of this study was to test and validate the usability of the current user interface, and provide evidence of usability in CareCloud. To this end, test data, time on task, and deviations are measured and a metrics measuring Task Success Rate was used to capture effectiveness, efficiency and satisfaction. Terms frequently used in this Usability test report are defined as follows:

- **Participant**: The user who had prior experience with CareCloud. The users participating in the test filled out Participation Document (Appendix 5.1) and completed Usability test.
- **Scenario:** A summary featuring information that provides clinical framework to the tasks handed out to the participants
- **Task**: A verbal and written clinical workflow, which has predefined goals at the end of all steps and provided to all participants during the Usability test.
- **Subtask**: A tasks section in which data is analyzed with a specific tool.
- **Test**: Compilation of tasks specific to the role of a participant in test session.
- **Path**: A series of actions in order to reach a goal in CareCloud.

This study was conducted on CareCloud version 2.2 for Ambulatory clinical modules.

Method

Participants

A total of 10 participants were tested on the EHRUT(s). Participants in the test were medical doctors (MDs) and nurse practitioners (NPs). Participants were recruited by our Client Management and Operations teams and were not compensated for their time. The participants conducted this test as a favor to the company and in order to provide feedback that would lead to improvements in the system they use today.

In addition, participants were not from the testing or supplier organization. Participants were users of the system hence they didn't need an enhanced level of training as non users would have received. They were provided with written steps for each task to be performed.

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	Role	Prof. Experience	Computer Experience	Product Experience	Assistive Technology Needs
1	F	40-49	Doctorate degree (e.g., MD, DNP, DMD, PhD)	Podiatrist / Provider	264	240	60	None
2	F	40-49	Doctorate degree (e.g., MD, DNP, DMD, PhD)	Chiropractor / Provider	144	240	24	None
3	M	30-39	Doctorate degree (e.g., MD, DNP, DMD, PhD)	Ophthalmology / Provider	132	312	24	None
4	F	40-49	Bachelor's Degree	Nurse Practitioner / Provider	140	216	12	None
5	M	50-59	Doctorate degree (e.g., MD, DNP, DMD, PhD)	Nurse Practitioner / COO	120	240	12	None
6	F	30-39	Master's Degree	Nurse Practitioner / Provider	96	240	12	None
7	M	40-49	Doctorate degree (e.g., MD, DNP, DMD, PhD)	Rheumatology / Provider	84	168	24	None
8	F	50-59	Doctorate degree (e.g., MD, DNP, DMD, PhD)	Rheumatology / Provider	168	84	5	None
9	F	40-49	Doctorate degree (e.g.,	Family Medicine /	144	120	66	None

			MD, DNP, DMD, PhD)	Provider				
10	F	30-39	Bachelor's Degree	Nurse	140	132	9	None

10 participants (matching the demographics in the section on Participants) were recruited and all 10 participated in the usability test.

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

Study Design

Overall, the objective of this test was to uncover areas where the application performed well (i.e., effectively, efficiently and with satisfaction) and areas where the application failed to meet the needs of the participants.

During the usability test, participants interacted with CareCloud. Each participant used the system in a remote session. They were provided with the same instructions by the moderator. 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
- Task deviations
- Participant satisfaction ratings of the system
- System Usability Scale score
- For additional information usability scale, see Table 3.10.

Tasks

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

- CPOE – Medication
- CPOE – Laboratory
- CPOE – Imaging
- Drug-Drug and Drug-Allergy interaction checks
- Patient Demographic Changes
- Problem List
- Medication List
- Medication Allergy List
- Clinical Decision Support (CDS)
- Implantable Device List
- Clinical Information Reconciliation and Incorporation
- E-Prescribe

These tasks were selected based on the 2015 Edition Health IT Certification criteria, considering frequency of user interactions, potential risks of user errors and criticality of function.

Procedures

Upon dialing in to the remote session, participants were greeted. Their identity was verified and matched to the names on the participant Schedule. The moderator was a CareCloud training support department personnel and has competence and knowledge to conduct such tests and scenarios.

Tasks featured in Participant Guide (Appendix II) were distributed to the groups prior to the testing so that they could review the instructions prior to the start of their test and familiarize themselves with the actions to be taken.

Participants were instructed to perform the tasks:
At their own pace without assistance; the moderator was only allowed to give immaterial guidance and clarification on tasks but not instructions for use without reductions in ratings. The Moderator provided immaterial guidance without using a think aloud technique.

The administrators started the sessions with the participants and then instructed them to begin performing the tasks. The participants had the written copies of the tasks as well as verbal instructions from the moderator. The task time was stopped once the participant indicated they had successfully completed the tasks.

Following the session, the participants conveyed their thoughts on the system to the moderator separately. Based on the feedback of the participants, the moderator investigated the causes of deviations and failures of the participants.

Test Location

The test was conducted in the participant healthcare institutions and via web conferencing. Only the participant was in the test room. All observers worked from a Join.me recorded session, where testers could see the participant's screen and listen to the audio of the session. To ensure that the environment was comfortable for users, noise levels were kept to a minimum.

Test Environment

The participants used mouse and keyboard when interacting with CareCloud. Since CareCloud operates in an enterprise cloud environment, all services may be accessed via web-browser, no installations were made on the test computers. The data entered in the system by each participant was not shared with any other participants. All participants were all provided with different default data setup. The participants utilized an up-to-date version of Google Chrome web browser while performing the tasks.

Test Forms and Tools

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

- Join.me
- Moderator's Guide

- Participant Guide

Participant guide is available in Appendix II. The moderator's Guide was devised so as to be able to capture required data. The participant's interaction with CareCloud was captured and recorded digitally with screen capture software running on the test machine. These records were saved and used in subsequent analyses.

Participant Instruction

The moderator gave a general introductory briefing before the session began. The participants were asked to complete a series of tasks which were presented to the participants in task sheets and also were read out by the moderator.

Usability Metrics

In accordance with 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:

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

Data Scoring

The following table (Table 3.10) details how tasks were scored, errors evaluated, and the timed data analyzed.

Measures	Rationale and Scoring
Task Success	A task was counted as a "***Success***" if the participant was able to achieve the correct outcome, without assistance, on a per task basis. Success was calculated separately for each task. If a task is completed with the assistance of the moderator, this will be counted as failure in the measurement report. The total number of successes were calculated for each task and then divided by the total number of times that task was attempted. The results are provided as a **percentage**. Task times were recorded for successes. Observed task times divided by the optimal time for each task is a measure of optimal efficiency.
Task Failures	If the participant abandoned the task, did not reach the correct answer, or performed it incorrectly, the task was not counted as 100% Successful or completed. Each task had a series of steps, percentage completion was allocated based on how many steps were successfully completed.

Task Deviations	The participant's path (i.e., steps) through the application was recorded. Deviations occur if the participant, for example, went to a wrong screen, clicked on an incorrect menu item, followed an incorrect link, or interacted incorrectly with an on-screen control. This path was compared to the optimal path. The number of steps in the observed path is divided by the number of optimal steps to provide a ratio of path deviation.
Task Time	Each task was timed and an average time per task was calculated for each task assigned. Variance measures (standard deviation and standard error) were also calculated.
Task Rating	Participant's subjective impression of the ease of use of the application was measured by administering both a simple post-task question as well as a post-session questionnaire.

Table 3.10 Data scoring details

Results

The results of the usability test were calculated according to the methods specified in the Usability Metrics section above. All participants were present in test session and no data was excluded from the analyses.

The usability testing results for CareCloud are detailed below:

Criteria 170.315(a1)(1) CPOE - Medications

Task Mapping

The table maps the 'Computerized Provider Order Entry (CPOE) medications' to usability test tasks to aid verification that the report will contain all required test scenarios. Bold font is used within the certification criteria and within the steps for successful task completion to aid verification that the usability test tasks address the details of the specified criteria.

Table: CPOE - medications test criteria and tasks

	'Computerized Provider Order Entry (CPOE) - Medications' Test Criteria and expectations are stated below, the Usability test must conform to the criteria that are not 'Optional':
	(i) Enable a user to **record**, **change**, and **access** medication orders. (ii) Optional. Include a "reason for order" field.
	To successfully complete the clinical task, participants were required to complete each of the following subtasks:
	Task A1.1: Record CPOE Medication Order Task A1.2: Change CPOE Medication Order Task A1.3: Access CPOE Medication Order

Task Participant and Instructions

Based on user characteristics, typical workflow, and tasks performed as part of their daily work, prescribers and nurses attempted this task.

Participant Task Instructions: The instructions are provided with **Appendix II -** Task Data Sheet with Task Numbers

Data Analysis and Reporting

Table: Test results for each subtask in CPOE - Medications task

	Measure							
	N	Task Success	Path Deviation	Task Time (Seconds)		Errors	Scenario Ratings (5=Easy)	Risk Scale
Task	#	Percent (%)	Deviations (Observed / Optimal)	Mean (SD)	Deviations (Observed / Optimal)	Percent (%)	Mean (SD)	(1 = least risky, 5 = most risky)
Task A1.1: Record CPOE Medication Order	10	98.0	7.4/7.0	168.7 (59.4)	88.7/80.0	2.0	NA	3
Task A1.2:Change CPOE Medication Order	10	100.0	4.7/2.0	41.2 (17.8)	26.2/15.0	0.0	NA	2

Task A1.3: Access CPOE Medication Order	10	100.0	3.0/3.0	74.8 (58.2)	64.8/10.0	0.0	NA	1

Discussion of the Findings
The following sections discuss the results organized around an error analysis, test performance and error rates. The error analysis includes identification of use errors and user interface design issues as well as classification of severity based on the consequence of the error.

Error Analysis
No critical use errors were identified or observed as part of CPOE-Medications task.

Effectiveness
Most Participants, as suggested by timings by expert users, were able to perform the tasks within optimal number of steps and time.

Efficiency
No additional opportunity is observed for improving efficiency.

Satisfaction
Not Applicable

Major Findings
Performance of three sub-groups are above 90% rate.

Areas for Improvement
No additional areas for improvement related to effectiveness and efficiency determined.

Criteria 170.315(a)(2) CPOE – Laboratory

Task Mapping
The table maps the '*Computerized Provider Order Entry (CPOE) laboratory'* criteria to usability test tasks to aid verification that the report will contain all required test scenarios for this EHR capability submitted for testing.

Table : CPOE - laboratory test criteria and tasks

	'Computerized Provider Order Entry (CPOE) - Laboratory Test Criteria and expectations are stated below,, the Usability test must conform to the criteria that are not 'Optional':
	(i) Enable a user to **record**, **change**, and **access** laboratory orders. (ii) Optional. Include a "reason for order" field.
	To successfully complete the clinical task, participants were required to complete each of the following subtasks:
	A2.1: Record Lab order via CPOE A2.2: Change Lab order via CPOE A2.3: Display changed CPOE Lab order

Task Participant and Instructions

Based on user characteristics, typical workflow, and tasks performed as part of their daily work, prescribers and nurses attempted this task.

Participant Task Instructions: The instructions are provided with **Appendix II -** Task Data Sheet with Task Numbers

Data Analysis and Reporting

Table: Test results for each subtask in CPOE - Laboratory task

	Measure							
	N	Task Success	Path Deviation	Task Time (Seconds)		Errors	Scenario Ratings (5=Easy)	Risk Scale
Task	#	Percent (%)	Deviations (Observed / Optimal)	Mean (SD)	Deviations (Observed / Optimal)	Percent (%)	Mean (SD)	(1 = least risky, 5 = most risky)
Task A2.1: Record Lab order via CPOE	10	97.5	7.0/7.0	263.3 (161.7)	198.3/65.0	2.5	NA	3
Task A2.2: Change Lab order via CPOE	10	98.8	8.0/8.0	119.6 (103.1)	69.6/50.0	1.3	NA	2

Task A2.3: Display changed CPOE Lab order	10	90.0	1.0/1.0	1.0 (0.3)	0/1.0	10.0	NA	4

Error Analysis
No critical use errors were identified or observed as part of CPOE-Laboratory task.

Effectiveness
All participants, as suggested by timings by expert users, were able to perform the tasks within optimal number of steps and time.

Efficiency
No additional opportunity is observed for improving efficiency.

Satisfaction
Success score of the participants was 3.5 on average based on 5 point Likert type scale

Major Findings
Performance of three sub-groups are 100% rate.

Areas for Improvement
No additional areas for improvement related to effectiveness and efficiency determined.

Criteria 170.315(a)(3) CPOE – Imaging

Task Mapping
The table maps the '*Computerized Provider Order Entry (CPOE) – Imaging'* criteria to usability test tasks to aid verification that the report will contain all required test scenarios for this EHR capability submitted for testing.

Table: CPOE - Imaging test criteria and tasks

	'Computerized Provider Order Entry (CPOE) - Medications' Test Criteria and expectations are stated below,, the Usability test must conform to the criteria that are not 'Optional':
	(i) Enable a user to **record**, **change**, and **access** Imaging orders. (ii) Optional. Include a "reason for order" field.
	To successfully complete the clinical task, participants were required to complete each of the following subtasks:
	A3.1: Record Imaging order via CPOE A3.2: Change Imaging order via CPOE A3.3: Display changed CPOE Imaging order

Task Participant and Instructions

Participant Task Instructions: The instructions are provided with **Appendix II -** Task Data Sheet with Task Numbers

Data Analysis and Reporting

Table: Test results for each subtask in CPOE - Imaging task

	Measure							
	N	Task Success	Path Deviation	Task Time (Seconds)		Errors	Scenario Ratings (5=Easy)	Risk Scale
Task	#	Percent (%)	Deviations (Observed / Optimal)	Mean (SD)	Deviations (Observed / Optimal)	Percent (%)	Mean (SD)	(1 = least risky, 5 = most risky)
Task A3.1: Record Imaging order via CPOE	10	96.5	7.5/7.0	90.4 (45)	60.4/30.0	3.5	NA	3
Task A3.2: Change Imaging order via CPOE	10	90.0	7.0/7.0	51.7 (40.3)	31.7/20.0	10.0	NA	4
Task A3.3: Display changed CPOE Imaging order	10	90.0	1.0/1.0	1.0 (0.3)	0/1.0	10.0	NA	4

Error Analysis

No critical use errors were identified or observed as part of CPOE-Medications task.

Effectiveness
All participants, as suggested by timings by expert users, were able to perform the tasks within optimal number of steps and time.

Efficiency
No additional opportunity is observed for improving efficiency.

Satisfaction
Not Applicable

Major Findings
Performance of three sub-groups are 100% rate.

Areas for Improvement
No additional areas for improvement related to effectiveness and efficiency determined.

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

Task Mapping
The table maps the *'Drug-Drug, Drug-Allergy Interaction Checks'* criteria to usability test tasks to aid verification that the report will contain all required test scenarios for this EHR capability submitted for testing.

Table : 'Drug-Drug, Drug-Allergy Interaction Checks' usability test criteria and tasks

	'Drug-Drug, Drug-Allergy Interaction Checks' Test criteria and expectations are stated below.
	(i) *Interventions.* Before a medication order is completed and acted upon during computerized provider order entry (CPOE), interventions must automatically indicate to a user drug-drug and drug-allergy contraindications based on a patient's medication list and medication allergy list.
	(ii) *Adjustments.* (A) Enable the severity level of interventions provided for drug-drug interaction checks to be adjusted. (B) Limit the ability to adjust severity levels in at least one of these two ways: (1) To a specific set of identified users. (2) As a system administrative function.
	To successfully complete the clinical task, participants were required to complete each of the following subtasks:
	Task A4.1: Using CPOE, trigger a drug-drug interaction by entering a new medication order Task A4.2: Using CPOE, trigger a drug-allergy interaction by entering a new medication order Task A4.3: Adjust the severity level of a displayed drug-drug interaction

Task Participant and Instructions

The instructions are provided with **Appendix II** – Task Data sheet with Task numbers.

Data Analysis and Reporting

Table : Drug-Drug, Drug-Allergy Interactions Checks test criteria and tasks

	Measure							
	N	Task Success	Path Deviation	Task Time (Seconds)		Errors	Scenario Ratings (5=Easy)	Risk Scale
Task	#	Percent (%)	Deviations (Observed / Optimal)	Mean (SD)	Deviations (Observed / Optimal)	Percent (%)	Mean (SD)	(1 = least risky, 5 = most risky)
Task A4.1: Using CPOE, trigger a drug-drug interaction by entering a new medication order	10	100.0	8.0/8.0	52.9 (16.6)	27.9/25.0	0.0	NA	1
Task A4.2: Using CPOE, trigger a drug-allergy interaction by entering a new medication order	10	100.0	6.0/6.0	79.5 (36.5)	44.5/35.0	0.0	NA	1
Task A4.3: Adjust the severity level of a displayed drug-drug interaction	10	100.0	7.0/7.0	129.1 (103.2)	111.1/18.0	0.0	NA	1

Error Analysis

No critical use errors were identified or observed as part *'Drug-Drug, Drug-Allergy Interaction Checks'* task.

Effectiveness

All participants, as suggested by timings by expert users, were able to perform the tasks within optimal number of steps and time.

Efficiency

No additional opportunity is observed for improving efficiency.

Satisfaction

Not Applicable

Major Findings
Performance of four sub-groups are 100% rate.

Areas for Improvement
No additional areas for improvement related to effectiveness and efficiency determined.

Criteria 170.315(a)(5) Demographics

Task Mapping
The table maps the '*Demographics'* to usability test tasks to aid verification that the report will contain all required test scenarios for this EHR capability submitted for testing.

Table : Demographics usability test criteria and tasks

	'Demographics' test criteria and expectations are stated below.
	(i) Enable a user to **record, change, and access** patient demographic data including race, ethnicity, preferred language, sex, sexual orientation, gender identity, and date of birth. *(A) Race and ethnicity.* (1) Enable each one of a patient's races to be recorded in accordance with, at a minimum, the standard specified in § 170.207(f)(2) and whether a patient declines to specify race. (2) Enable each one of a patient's ethnicities to be recorded in accordance with, at a minimum, the standard specified in § 170.207(f)(2) and whether a patient declines to specify ethnicity. (3) Aggregate each one of the patient's races and ethnicities recorded in accordance with paragraphs (a)(5)(i)(A)(*1*) and (*2*) of this section to the categories in the standard specified in § 170.207(f)(1). *(B) Preferred language.* Enable preferred language to be recorded in accordance with the standard specified in § 170.207(g)(2) and whether a patient declines to specify a preferred language. *(C) Sex.* Enable sex to be recorded in accordance with the standard specified in § 170.207(n)(1). *(D) Sexual orientation.* Enable sexual orientation to be recorded in accordance with the standard specified in § 170.207(o)(1) and whether a patient declines to specify sexual orientation.
	(E) *Gender identity.* Enable gender identity to be recorded in accordance with the standard specified in § 170.207(o)(2) and whether a patient declines to specify gender identity. (ii) *İnpatient setting only.* Enable a user to record, change, and access the preliminary cause of death and date of death in the event of mortality.
	To successfully complete the clinical task, participants were required to complete each of the following subtasks:

	Task A5.1: Record a patient's preferred language, date of birth, birth sex, race, ethnicity, sexual orientation, gender identity, preliminary cause of death (inpatient only), and preliminary date of death (inpatient only) Task A5.2: Change the patient's preferred language, date of birth, birth sex, race, ethnicity, sexual orientation, gender identity, preliminary cause of death (inpatient only), and preliminary date of death (inpatient only) Task A5.3: Display the patient's changed preferred language, date of birth, birth sex, race, ethnicity, sexual orientation, gender identity, preliminary cause of death (inpatient only), and preliminary date of death (inpatient only)

Task Participant and Instructions

The instructions are provided with **Appendix II** – Task Data sheet with Task numbers.

Data Analysis and Reporting

Table: Test results for each subtask in Demographics task

	Measure							
	N	Task Success	Path Deviation	Task Time (Seconds)		Errors	Scenario Ratings (5=Easy)	Risk Scale
Task	#	Percent (%)	Deviations (Observed / Optimal)	Mean (SD)	Deviations (Observed / Optimal)	Percent (%)	Mean (SD)	(1 = least risky, 5 = most risky)
Task A5.1: Record a patient's preferred language, date of birth, birth sex, race, ethnicity, sexual orientation, gender identity, preliminary cause of death (inpatient only), and preliminary date of death (inpatient only)	10	89.0	12.8/14.0	245.0 (92.3)	85.0/160.0	11.0	NA	4
Task A5.2: Change the patient's preferred language, date of birth, birth sex, race, ethnicity, sexual orientation, gender identity, preliminary cause of death (inpatient	10	96.5	12.5/13.0	185.9 (59.8)	65.9/120.0	1.0	NA	2

only), and preliminary date of death (inpatient only)								
Task A5.3: Display the patient's changed preferred language, date of birth, birth sex, race, ethnicity, sexual orientation, gender identity, preliminary cause of death (inpatient only), and preliminary date of death (inpatient only)	10	100.0	1.0/1.0	22.1 (52.1)	20.1/2.0	0.0	NA	1

Error Analysis
No critical use errors were identified or observed as part of *'Demographics'* task.

Effectiveness
All participants, as suggested by timings by expert users, were able to perform the tasks within optimal number of steps and time.

Efficiency
No additional opportunity is observed for improving efficiency.

Satisfaction
Not Applicable

Major Findings
Performance of five sub-groups are very close to 100% rate.

Areas for Improvement
No additional areas for improvement related to effectiveness and efficiency determined.

Criteria 170.315(a)(6) Problem List

Task Mapping
The table maps the '*Problem List'* criteria to usability test tasks to aid verification that the report will contain all required test scenarios for this EHR capability submitted for testing.

Table: Problem List usability test criteria and tasks

	'Problem List' test criteria and expectations are stated below.

	Enable a user to **record**, **change**, and **access** a patient's active problem list: *(i) Ambulatory setting only.* Over multiple encounters in accordance with, at a minimum, the version of the standard specified in §170.207(a)(4). *(ii) Inpatient setting only.* For the duration of an entire hospitalization in accordance with, at a minimum, the version of the standard specified in §170.207(a)(4).

	To successfully complete the clinical task, participants were required to complete each of the following subtasks:
	Task A6.1: Record a problem to the problem list Task A6.2: Change a problem on the problem list Task A6.3: Display the active problem list Task A6.4: Display the historical problem list

Task Participant and Instructions

The instructions are provided with **Appendix II** – Task Data sheet with Task numbers.

Data Analysis and Reporting

Table: Test results for each subtask in Problem List

	Measure							
	N	Task Success	Path Deviation	Task Time (Seconds)		Errors	Scenario Ratings (5=Easy)	Risk Scale
Task	#	Percent (%)	Deviations (Observed / Optimal)	Mean (SD)	Deviations (Observed / Optimal)	Percent (%)	Mean (SD)	(1 = least risky, 5 = most risky)
Task A6.1: Record a problem to the problem list	10	98.0	5.6/5.0	60.0 (30.4)	40.0/20.0	2.0	NA	2
Task A6.2: Change a problem on the problem list	10	100.0	6.1/6.0	54.5 (24.8)	34.5/20.0	0.0	NA	1
Task A6.3: Display the active problem list	10	100.0	2.0/2.0	25.3 (19.8)	15.3/10.0	0.0	NA	1

Task A6.4: Display the historical problem list	10	100.0	2.0/2.0	1.0 (0)	0/1.0	0.0	NA	1

Error Analysis
No critical use errors were identified or observed as part of *'Problem List'* task.

Effectiveness
All participants, as suggested by timings by expert users, were able to perform the tasks within optimal number of steps and time.

Efficiency
No additional opportunity is observed for improving efficiency.

Satisfaction
Average success score of the participants was 3.2˜ on average based on 5 point Likert-type scale.

Major Findings
Performance of six sub-groups are 100% rate.

Areas for Improvement
No additional areas for improvement related to effectiveness and efficiency determined.

Criteria 170.315(a)(7) Medication List

Task Mapping
The table maps the '*Medication List'* criteria to usability test tasks to aid verification that the report will contain all required test scenarios for this EHR capability submitted for testing.

Table: 'Medication List' usability test criteria and tasks

	'Computerized Provider Order Entry (CPOE) - Medications' test criteria and expectations are stated below, the Usability test must conform to the criteria that are not 'Optional':
	Enable a user to record, change, and **access** a patient's active medication list as well as medication history: *(i) Ambulatory setting only.* Over multiple encounters. *(ii) Inpatient setting only.* For the duration of an entire hospitalization.
	To successfully complete the clinical task, participants were required to complete each of the following subtasks:
	Task A7.1: Record a medication to the medication list Task A7.2: Change a medication on the medication list Task A7.3: Display the active medication list Task A7.4: Display the historical medication list

Task Participant and Instructions

The instructions are provided with **Appendix II** – Task Data sheet with Task numbers.

Data Analysis and Reporting

Table : Test results for each subtask in Medication List task

	Measure							
	N	Task Success	Path Deviation	Task Time (Seconds)		Errors	Scenario Ratings (5=Easy)	Risk Scale
Task	#	Percent (%)	Deviations (Observed / Optimal)	Mean (SD)	Deviations (Observed / Optimal)	Percent (%)	Mean (SD)	(1 = least risky, 5 = most risky)
Task A7.1: Record a medication to the medication list	10	100.0	6.0/6.0	64.7 (36.4)	49.7/15.0	0.0	NA	1
Task A7.2: Change a medication on the medication list	10	100.0	9.0/9.0	91.7 (45.5)	54.7/37.0	0.0	NA	1
Task A7.3: Display the active medication list	10	100.0	2.6/2.0	33.5 (27.8)	25.5/8.0	0.0	NA	1
Task A7.4: Display the historical medication list	10	100.0	2.5/2.0	4.4 (8.4)	3.4/1.0	0.0	NA	1

Error Analysis

No critical use errors were identified or observed as part of *'Medication List'* task.

Effectiveness

All participants, as suggested by timings by expert users, were able to perform the tasks within optimal number of steps and time.

Efficiency

No additional opportunity is observed for improving efficiency.

Satisfaction

Not Applicable

Major Findings
Performance of six sub-groups are 100% rate.

Areas for Improvement
No additional areas for improvement related to effectiveness and efficiency determined.

Criteria 170.315(a)(8) Medication Allergy List

Task Mapping
The table maps the '*Medication Allergy List'* criteria to usability test tasks to aid verification that the report will contain all required test scenarios for this EHR capability submitted for testing.

Table : Medication Allergy List usability test criteria and tasks

	'Medication Allergy List' test criteria and expectations are stated below.
	Enable a user to record, change, and access a patient's active medication allergy list as well as medication allergy history: *(i) Ambulatory setting only.* Over multiple encounters. *(ii) Inpatient setting only.* For the duration of an entire hospitalization.
	To successfully complete the clinical task, participants were required to complete each of the following subtasks:
	Task A8.1: Record a medication allergy Task A8.2: Change a medication allergy Task A8.3: Display the active medication allergy list Task A8.4: Display the historical medication allergy list

Task Participant and Instructions
The instructions are provided with **Appendix II** – Task Data sheet with Task numbers.

Data Analysis and Reporting
Table : Test results for each subtask in Medication Allergy List task

	Measure							
	N	Task Success	Path Deviation	Task Time (Seconds)		Errors	Scenario Ratings (5=Easy)	Risk Scale
Task	#	Percent (%)	Deviations (Observed / Optimal)	Mean (SD)	Deviations (Observed / Optimal)	Percent (%)	Mean (SD)	(1 = least risky, 5 = most risky)
Task A8.1: Record a medication allergy	10	100.0	6.0/6.0	61.6 (22.9)	26.6/35.0	0.0	NA	1

Task A8.2: Change a medication allergy	10	99.0	9.4/9.0	83.5 (69.2)	55.5/28.0	1.0	NA	2
Task A8.3: Display the active medication allergy list	10	100.0	2.0/2.0	31.8 (22.6)	21.8/10.0	0.0	NA	1
Task A8.4: Display the historical medication allergy list	10	100.0	2.0/2.0	1.0 (0)	0/1.0	0.0	NA	1

Error Analysis
No critical use errors were identified or observed as part of *'Medication Allergy List'* task.

Effectiveness
All participants, as suggested by timings by expert users, were able to perform the tasks within optimal number of steps and time.

Efficiency
No additional opportunity is observed for improving efficiency.

Satisfaction
Average success score of the participants was 3 on average based on 5 point Likert-type scale.

Major Findings
Performance of six sub-groups are 100% rate.

Areas for Improvement
No additional areas for improvement related to effectiveness and efficiency determined.

Criteria 170.315(a)(9) Clinical Decision Support

Task Mapping
The table maps the '*Computerized Provider Order Entry (CPOE) medications'* criteria to usability test tasks to aid verification that the report will contain all required test scenarios for this EHR capability submitted for testing.

Table : 'Clinical Decision Support' usability test criteria and tasks

	'Clinical Decision Support' test criteria and expectations are stated below.

	(i) *CDS intervention interaction.* Interventions provided to a user must occur when a user is interacting with technology. (ii) *CDS configuration.* *(A)* Enable interventions to be configured by a limited set of identified users (e.g., system administrator) based on a user's role. *(B)* Enable interventions: (1) Based on the following data: (i) Problem list; (ii) Medication list; (iii) Medication allergy list; (iv) At least one demographic specified in paragraph (a)(5)(i) of this section; (v) Laboratory tests; and (vi) Vital signs. (2) When a patient's medications, medication allergies, and problems are incorporated from a transition of care/referral summary received. *(iii) Evidence-based decision support interventions. Enable a limited set of identified users to select (i.e., activate) electronic CDS interventions (in addition to drug-drug and drug-allergy contraindication checking) based on each one and at least one combination of the data referenced in paragraphs (a)(9)(ii)(B)(1)(i) through (vi) of this section.* (iv) *Linked referential CDS.* (A) Identify for a user diagnostic and therapeutic reference information in accordance at least one of the following standards and implementation specifications: (1) The standard and implementation specifications specified in §170.204(b)(3). (2) The standard and implementation specifications specified in §170.204(b)(4) (B) For paragraph (a)(9)(iv)(A) of this section, technology must be able to identify for a user diagnostic or therapeutic reference information based on each one and at least one combination of the data referenced in paragraphs (a)(9)(ii)(B)(*1*)(*i*), (*ii*), and (*iv*) of this section. (v) *Source attributes.* Enable a user to review the attributes as indicated for all CDS resources: (A) For evidence-based decision support interventions under paragraph (a)(9)(iii) of this section: (1) Bibliographic citation of the intervention (clinical research/guideline); (2) Developer of the intervention (translation from clinical research/guideline); (3) Funding source of the intervention development technical implementation; and (4) Release and, if applicable, revision date(s) of the intervention or reference source. (B) For linked referential CDS in paragraph (a)(9)(iv) of this section and drug-drug, drug-allergy interaction checks in paragraph (a) (4) of this section, the developer of the intervention, and where clinically indicated, the bibliographic citation of the intervention (clinical research/guideline).
	To successfully complete the clinical task, participants were required to complete each of the following subtasks:

	Task A9.1, A9.2, A9.3: Add a CDS intervention and/or reference resource for each of the required elements: Problem List, Medication List, Medication Allergy List, at least one Demographic, Laboratory Test, Vital Signs, and a Combination of at least 2 of the elements above Task A9.4, A9.5, A9.7: View the intervention/resource information using the Infobutton standard for data elements in the problem list, medication list, and demographics Task A9.6: Access the following attributes for one of the triggered CDS interventions/resources: bibliographic citation, developer, funding source, release/revision date Task A9.8, A9.9, A9.10: Trigger the CDS interventions/resources added using the applicable data elements from each of the required elements Task A9.11, A9.12, A9.13: Trigger the CDS interventions/resources based on data elements in the problem list, medication list, and medication allergy list by incorporating patient information from a transition of care/referral summary

Task Participant and Instructions

Based on user characteristics, typical workflow, and tasks performed as part of their daily work, providers and clinical assistive personnel attempted this task.
The instructions are provided with **Appendix II** – Task Data sheet with Task numbers.

Data Analysis and Reporting

Table : Test results for each subtask in Medication Allergy List task

	Measure							
	N	Task Success	Path Deviation	Task Time (Seconds)		Errors	Scenario Ratings (5=Easy)	Risk Scale
Task	#	Percent (%)	Deviations (Observed / Optimal)	Mean (SD)	Deviations (Observed / Optimal)	Percent (%)	Mean (SD)	(1 = least risky, 5 = most risky)
Task A9.1, A9.2, A9.3: Add a CDS intervention and/or reference resource for each of the required elements: Problem List, Medication List, Medication Allergy List, at least one Demographic, Laboratory Test, Vital Signs, and a Combination of at least 2 of the elements above	10	99.0	11.0/11.0	163.8 (72.0)	88.8/75.0	1.0	NA	1

Task A9.4, A9.5, A9.7: Trigger the CDS interventions/resources added using the applicable data elements from each of the required elements	10	90.0	11.7/13.0	164.8 (88.5)	75.8/89.0	10.0	NA	4
Task A9.6: View the intervention/resource information using the Infobutton standard for data elements in the problem list, medication list, and demographics	10	65.6	8.5/8.0	398.8 (309.0)	368.8/30.0	31.0	NA	5
Task A9.8, A9.9, A9.10: Trigger the CDS interventions/resources based on data elements in the problem list, medication list, and medication allergy list by incorporating patient information from a transition of care/referral summary	10	87.5	9.9/11.0	102.1 (47.0)	28.1/74.0	12.5	NA	4
Task A9.11, A9.12, A9.13: Access the following attributes for one of the triggered CDS interventions/resources: bibliographic citation, developer, funding source, release/revision date	10	85.0	7.6/9.0	175.4 (77.5)	35.4/140.0	15.0	NA	4

Error Analysis

No critical use errors were identified or observed as part of *'Clinical Decision Support'* task.

Effectiveness
All participants, as suggested by timings by expert users, were able to perform the tasks within optimal number of steps and time.

Efficiency
No additional opportunity is observed for improving efficiency.

Satisfaction
Not Applicable

Major Findings
Performance of four sub-groups are above 80% rate.

Areas for Improvement
No additional areas for improvement related to effectiveness and efficiency determined.

Criteria 170.315(a)(14) Implantable Device List

Task Mapping
The table maps the ‘*'Implantable Device List'* criteria to usability test tasks to aid verification that the report will contain all required test scenarios for this EHR capability submitted for testing.
Table : 'Implantable Device List' usability test criteria and tasks

	'Implantable Device List' test criteria and expectations are stated below.

	(i) Record unique device identifiers associated with a patient's Implantable Devices. (ii) Parse the following identifiers from a Unique Device Identifier: (A) Device Identifier; and (B) The following identifiers that compose the Production Identifier: (1) The lot or batch within which a device was manufactured; (2) The serial number of a specific device; (3) The expiration date of a specific device; (4) The date a specific device was manufactured; and (5) For an HCT/P regulated as a device, the distinct identification code required by 21 CFR 1271.290(c). (iii) Obtain and associate with each Unique Device Identifier: (A) A description of the implantable device referenced by at least one of the following: (1) The "GMDN PT Name" attribute associated with the Device Identifier in the Global Unique Device Identification Database. (2) The "SNOMED CT® Description" mapped to the attribute referenced in in paragraph (14)(iii)(A)(*1*) of this section. (B) The following Global Unique Device Identification Database attributes: (1) "Brand Name"; (2) "Version or Model"; (3) "Company Name"; (4) "What MRI safety information does the labeling contain?"; and (5) "Device required to be labeled as containing natural rubber latex or dry natural rubber (21 CFR 801.437)." (iv) Display to a user an implantable device list consisting of: (A) The active Unique Device Identifiers recorded for the patient; (B) For each active Unique Device Identifier recorded for a patient, the description of the implantable device specified by paragraph (a)(14)(iii)(A) of this section; and (C) A method to access all Unique Device Identifiers recorded for a patient.
	(v) A method to access all Unique Device Identifiers recorded for a patient. (A) The Unique Device Identifier; (B) The description of the implantable device specified by paragraph (a)(14)(iii)(A) of this section; (C) The identifiers associated with the Unique Device Identifier, as specified by paragraph (a)(14)(ii) of this section; and (D) The attributes associated with the Unique Device Identifier, as specified by paragraph (a)(14)(iii)(B) of this section. (vi) Enable a user to change the status of a Unique Device Identifier recorded for a patient.
	To successfully complete the clinical task, participants were required to complete each of the following subtasks:
	Task A14.1: Record UDI Task A14.2: Change UDI Status Task A14.3: Access UDI, Device Description, Identifiers and Attributes

Task Participant and Instructions

The instructions are provided with **Appendix II** – Task Data sheet with Task numbers.

Data Analysis and Reporting

Table : Test results for each subtask in Implantable Device List task

	Measure							
	N	Task Success	Path Deviation	Task Time (Seconds)		Errors	Scenario Ratings (5=Easy)	Risk Scale
Task	#	Percent (%)	Deviations (Observed / Optimal)	Mean (SD)	Deviations (Observed / Optimal)	Percent (%)	Mean (SD)	(1 = least risky, 5 = most risky)
Task A14.1: Record UDI	10	85.0	7.7/9.0	367.8(240)	202.8/165.0	15.0	NA	4
Task A14.2: Change UDI Status	10	78.0	4.3/4.0	38.2 (30.5)	23.2/15.0	22.0	NA	5
Task A14.3: Access UDI, Device Description, Identifiers and Attributes	10	79.0	3.1/4.0	20.7 (23.2)	10.7/10.0	21.0	NA	5

Error Analysis

No critical use errors were identified or observed as part of *'Implantable Device List'* task.

Effectiveness

All participants, as suggested by timings by expert users, were able to perform the tasks within optimal number of steps and time. One participant initially could not understand at the stage of recording tested device codes. One user was affected by an automatically added device code .

Efficiency

No additional opportunity is observed for improving efficiency.

Satisfaction

Average success score of the participants was 3 on average based on 5 point Likert-type scale.

Major Findings

Performance of four sub-groups are 100% rate

Areas for Improvement

No additional areas for improvement related to effectiveness and efficiency determined.

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

Task Mapping

The table maps the '*Computerized Provider Order Entry (CPOE) medications'* criteria to usability test tasks to aid verification that the report will contain all required test scenarios for this EHR capability submitted for testing.

Table : 'Computerized Provider Order Entry (CPOE) medications' usability test criteria and tasks

	′Clinical Information Reconciliation and Incorporation′ test criteria and expectations are stated below.
	(i) *General requirements.* Paragraphs (b)(2)(ii) and (iii) of this section must be completed based on the receipt of a transition of care/referral summary formatted in accordance with the standards adopted in §170.205(a)(3) and §170.205(a)(4) using the Continuity of Care Document, Referral Note, and (inpatient setting only) Discharge Summary document templates.
	(ii) *Correct patient.* Upon receipt of a transition of care/referral summary formatted according to the standards adopted §170.205(a)(3) and §170.205(a)(4), technology must be able to demonstrate that the transition of care/referral summary received can be properly matched to the correct patient. (iii) *Reconciliation.* Enable a user to reconcile the data that represent a patient's active medication list, medication allergy list, and problem list as follows. For each list type: (A) Simultaneously display (i.e., in a single view) the data from at least two sources in a manner that allows a user to view the data and their attributes, which must include, at a minimum, the source and last modification date. (B) Enable a user to create a single reconciled list of each of the following: Medications; medication allergies; and problems. (C) Enable a user to review and validate the accuracy of a final set of data. (D) Upon a user's confirmation, automatically update the list, and incorporate the following data expressed according to the specified standard(s): (1) *Medications.* At a minimum, the version of the standard specified in §170.207(d)(3); (2) *Medication allergies.* At a minimum, the version of the standard specified in §170.207(d)(3); and (3) *Problems.* At a minimum, the version of the standard specified in §170.207(a)(4). *System verification.* Based on the data reconciled and incorporated, the technology must be able to create a file formatted according to the standard specified in §170.205(a)(4) using the Continuity of Care Document template.
	To successfully complete the clinical task, participants were required to complete each of the following subtasks:
	Task B2.1: Incorporate a CCDA and conduct reconciliation of the medications, medication allergies, and problems in the CCDA with the information currently in the patient's record Task B2.2: Generate a new CCDA with reconciled data

Task Participant and Instructions

The instructions are provided with **Appendix II** – Task Data sheet with Task numbers.

Data Analysis and Reporting

Table : Test results for each subtask in Implantable Device List task

	Measure							
	N	Task Success	Path Deviation	Task Time (Seconds)		Errors	Scenario Ratings (5=Easy)	Risk Scale
Task	#	Percent (%)	Deviations (Observed / Optimal)	Mean (SD)	Deviations (Observed / Optimal)	Percent (%)	Mean (SD)	(1 = least risky, 5 = most risky)
Task B2.1: Incorporate a CCDA and conduct reconciliation of the medications, medication allergies, and problems in the CCDA with the information currently in the patient's record	10	80.0	9.8/10.0	168.8 (76.2)	80.8/88.0	20.0	NA	5
Task B2.2: Generate a new CCDA with reconciled data	10	80.0	3.8/4.0	81.8 (41.3)	54.8/27.0	20.0	NA	5

Error Analysis

No critical use errors were identified or observed as part of *'Clinical Information Reconciliation'* task.

Effectiveness

All participants, as suggested by timings by expert users, were able to perform the tasks within optimal number of steps and time.

Efficiency

No additional opportunity is observed for improving efficiency.

Satisfaction

Not Applicable

Major Findings

Performance of three sub-groups are 100% rate.

Areas for Improvement

No additional areas for improvement related to effectiveness and efficiency determined.

Criteria 170.315(b)(3) e-Prescribing

Task Mapping

The table maps the '*e-Prescribing'* criteria to usability test tasks to aid verification that the report will contain all required test scenarios for this EHR capability submitted for testing.

Table : 'e-Prescribing' usability test criteria and tasks

	'e-Prescribing*'* test criteria and expectations are stated below.
	(i) Enable a user to perform all of the following prescription-related electronic transactions in accordance with the standard specified in §170.205(b)(2) and, at a minimum, the version of the standard specified in §170.207(d)(3) as follows: (A) Create new prescriptions (NEWRX). (B) Change prescriptions (RXCHG, CHGRES). (C) Cancel prescriptions (CANRX, CANRES).
	(D) Refill prescriptions (REFREQ, REFRES). (E) Receive fill status notifications (RXFILL). (F) Request and receive medication history information (RXHREQ, RXHRES). (ii) For each transaction listed in paragraph (b)(3)(i) of this section, the technology must be able to receive and transmit the reason for the prescription using the diagnosis elements in DRU Segment. (iii) *Optional.* For each transaction listed in paragraph (b)(3)(i) of this section, the technology must be able to receive and transmit the reason for the prescription using the indication elements in the SIG Segment. (iv) Limit a user's ability to prescribe all oral liquid medications in only metric standard units of mL (i.e., not cc). (v) Always insert leading zeroes before the decimal point for amounts less than one and must not allow trailing zeroes after a decimal point when a user prescribes medications.
	To successfully complete the clinical task, participants were required to complete each of the following subtasks:
	Task B3.1: Create new prescriptions Task B3.2: Change prescriptions Task B3.3: Cancel prescriptions Task B3.4: Refill prescriptions (Status) Task B3.5: Receive Fill Status Notification Task B3.6: Request and Receive Medication History Information

Task Participant and Instructions

The instructions are provided with **Appendix II** – Task Data sheet with Task numbers.

Data Analysis and Reporting

Table: e-Prescribing usability test criteria and tasks

	Measure							
	N	Task Success	Path Deviation	Task Time (Seconds)		Errors	Scenario Ratings (5=Easy)	Risk Scale
Task	#	Percent (%)	Deviations (Observed / Optimal)	Mean (SD)	Deviations (Observed / Optimal)	Percent (%)	Mean (SD)	(1 = least risky, 5 = most risky)
Task B3.1: Create new prescriptions	10	90.0	5.7/6.0	148.5 (103.1)	98.5/50.0	10	NA	4
Task B3.2: Change prescriptions	10	84.0	5.0/5.0	86.6 (54.6)	62.6/24.0	16	NA	4
Task B3.3: Cancel prescriptions	10	85.0	7.8/8.0	140.4 (79.3)	80.4/60.0	15	NA	4
Task B3.4: Refill prescriptions (Status)	10	90.0	4.8/5.0	48.2 (16.9)	18.2/30.0	10.0	NA	4
Task B3.5: Receive Fill Status Notification	10	85.0	12.5/13.0	220.9 (211.6)	208.9/12.0	15.0	NA	4
Task B3.6: Request and Receive Medication History Information	10	100.0	6.0/6.0	78.0 (76.1)	74.0/4.0	0.0	NA	1

Error Analysis

Surescripts tool is used to test several steps in ‘e_prescribing’ task. Hypothetic patient and medical data are specially created for conduct of this test correctly.

Effectiveness

'e-Prescribing' test was conducted with the moderator pushing responses from Surescripts tool to complete end to end WF.

Efficiency
No additional opportunity is observed for improving efficiency

Satisfaction
Not Applicable

Major Findings
Performance of four sub-groups are 100% rate.

Areas for Improvement
No additional areas for improvement related to effectiveness and efficiency determined.

Appendix 1: Recruiting Criteria

The following criteria were used to recruit participants to the EHRUT program:

- Demographic Criteria
  - 30-39 yrs old - 20% of participants
  - 40-49 yrs old - 40% of participants
  - 50-59 yrs old - 40% of participants
- Computer Experience Criteria
  - Low - 25%
  - Medium - 50%
  - High - 25%
- Medical Practice Environment
  - 1-2 providers - 25%
  - 2-10 providers - 50%
  - 11+ providers - 25%

Recruiting Script

Hi [Client Name],

I hope this email finds you well! We are looking for volunteers to perform usability testing of Charts in order for us to get our ONC 2015 certification.

Our product manager will run the test on a Join.me and record the session. The recordings will then be made available to our ONC 2015 auditors. The sessions will last about an hour or two. It is unlikely that we will need any follow-up after the initial testing session.

While we cannot compensate for your time, we greatly appreciate the help to make CareCloud Charts work better!

Here is the list of modules volunteers will be testing:

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

Please let me know as soon as possible whether you are interested in participating, as testing will begin next week. Thanks so much!

Appendix II: Participant User Guide

Please find a separate document attachment

Appendix III: Informed Consent

This evaluation is about the utilization and configuration of CareCloud.

The purpose of this study is to gather feedback about the effectiveness and efficiency of the CareCloud solution.

I agree to treat all information as confidential during this evaluation in accordance with this nondisclosure and informed consent agreement. Accordingly, I will not disclose confidential information to any third parties.

I authorize CareCloud to keep, use in any manner and dispose of the findings from this evaluation, including my feedback and opinions expressed.

I understand that my participation is completely voluntary and that I may leave at any time.

I also understand that the testing session will be conducted via screen sharing and recording of the session (audio as well as screen capture recording).

I have read and understand the instructions and expectations of this usability test.

_____ _____

Name Date and Signature

Title/Position

Appendix IV: System Usability Scale

In order to quickly assess opinions of users expressed during their experience with system, System Usability Scale (SUS) methods are used. Details on calculation of the SUS can be accessed through this link (*http://www.usabilitynet.org/trump/documents/Suschapt.doc*)

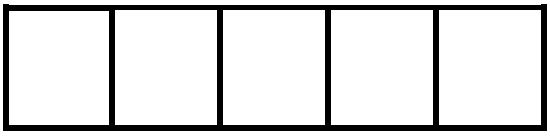
Please Evaluate Functionality

This scale, measures your general impression on the test conducted today.

1 - Strongly Disagree, 2 – Disagree, 3 – Neutral, 4 – Agree, 5 - Strongly Agree

Strongly Agree

Strongly Disagree



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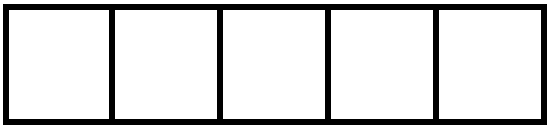

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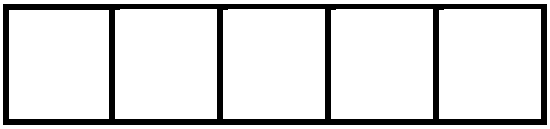

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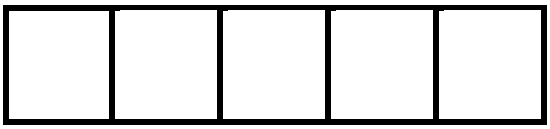

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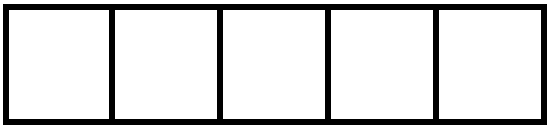

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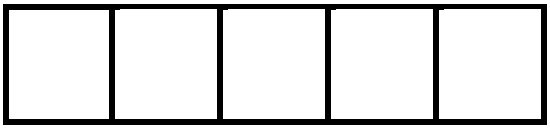

1 2 3 4 5

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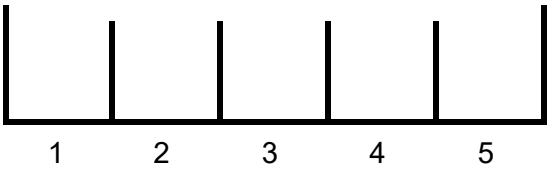
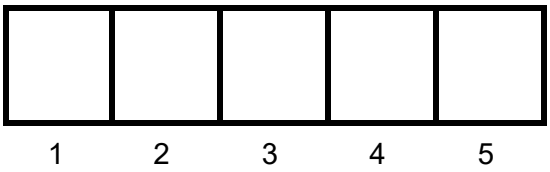
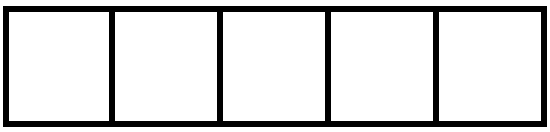






2. I found the system unnecessarily complex

3. I thought the system was easy to use

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

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

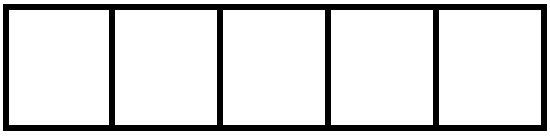
6. I thought there was too much inconsistency in this system

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

8. I found the system very cumbersome to use

9. I felt confident using the system

1 2 3 4 5



10. I needed to learn a lot before using the system

1 2 3 4 5