IHS RESOURCE AND PATIENT MANAGEMENT SYSTEM

SUMMATIVE USABILITY TESTING FINAL REPORT

Version: 2.0

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Dates of Testing: Group A: 11/5/2019-11/14/2019
Group B: 7/21/2020-8/3/2020
Group C: 8/3/2020-8/7/2020

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Version History

Date	Version	Revised By:	Revision/Change Description
8/7/2020	1.0	Jason Nakai	Initial Draft
8/20/2020	2.0	Jason Nakai	Updated

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1.0   Executive Summary

Summative usability testing (hereinafter referred to as "usability testing") of the Resource and Patient Management System (RPMS) Electronic Heath Record (EHR) application was conducted during 2019 - 2020 as part of the 2015 Certified Health IT (g)(3) Safety-Enhanced Design criterion. The purpose of this test was to evaluate and validate the usability of the current user interface, and provide evidence of user-centered design (UCD) practices in the application.

During the usability test, healthcare providers and other users matching the target demographic criteria participated in summative usability testing for each safety-enhanced design criterion and the associated capabilities.

This study collected performance data on the top tasks as identified by the owners of the criteria to be tested.

The criteria included in this test report are:

- 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 interaction checks

- 170.315(a)(5) Demographics

- 170.315(a)(9) Clinical decision support

- 170.315(a)(14) Implantable Device List (IDL)

- 170.315(b)(2) Clinical Information Reconciliation and Incorporation (CIR)

These criteria were broken down into 3 test groups (A, B, and C).

During the approximately 60-minute one-on-one usability test sessions, each participant was greeted by the administrator who introduced the test. Participants were asked to share their prior EHR experience.

During each test session, the administrator timed the test and recorded user performance data. Participant screens and audio were also recorded for subsequent analysis.

The following types of data were collected for each participant:

- Demographic data

- Number of tasks successfully completed

- Time to complete the tasks

- Number and types of errors

- Path deviations

- Participant's verbalizations (comments)

- Participant's satisfaction ratings of the system

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

The test method and metrics were based on the National Institute of Standards and Technology (NIST) Guide to the Processes Approach for Improving the Usability of Electronic Health Records (NISTIR 7741). Modifications were made where necessary to better evaluate the application against the contract goals and requirements. Following the conclusion of the test, participants were asked to complete a post-test questionnaire and were thanked for their participation.

The Task Satisfaction Rating is based on the following pre-defined scale:

- 1 (Very Difficult) – 5 (Very Easy).

1.1   Major Findings

Based on the score of the Task Satisfaction Rating, the participants found the EHR easy to use. Participants did state that the initial learning curve is steep and training is necessary. However, once they learned to use the application, participants completed tasks with great efficiency and effectiveness.

Criteria	Task Success Rate Mean %	Task Satisfaction Rating (Scale 1-5) 1(Very Difficult)-5(Very Easy)
170.315(a)(1) Computerized provider order entry—medications	100%	4.67
170.315(a)(2) Computerized provider order entry—laboratory	100%	4.83
170.315(a)(3) Computerized provider order entry—diagnostic imaging	92%	4.67
170.315(a)(4) Drug-drug, drug-allergy interaction checks	100%	4.67
170.315(a)(5) Demographics	100%	4.91
170.315(a)(9) Clinical decision support	100%	5
170.315(a)(14) Implantable Device List (IDL)	88%	4.21
170.315(b)(2) Clinical Information Reconciliation and Incorporation (CIR)	98%	4.68

Table 1: Criteria Success and Satisfaction Rating Summary

1.2   Recommendations

Group A

Criteria/Module	Findings
(a)(1) CPOE – medications	Clinical Indication box under Medication Order -- if a provider has not already added a diagnosis to the problem list and they search for it here, it does not also save to the problem list; this causes some providers frustration. Participants did not like that if POV is not added for acute visit, they have to go to dropdown menu and select what the medicine is treating.
(a)(2) CPOE – laboratory	'Order a Lab Test' screen – when a provider is searching a 'clinical indication' but has not added it to the problem list, there is no additional option to add it to the problem list from this screen.
(a)(3) CPOE – diagnostic imaging	Fix tab order of form fields. Improve form field labeling.
(a)(4) Drug-drug, drug-allergy interaction checks for CPOE	Would like to see a hard stop for alerts, something interactive that providers would have to read and acknowledge they have done before continuing. Better configuration for alerts to reduce alert fatigue.
(a)(9) Clinical decision support	Better training available on demand. Better documentation and training on troubleshooting procedures. Nurses have commented that they would like the capability to complete the note/dialogue associated with the reminder from the "Available Reminders" pop up box. Needs to be more flexible of configurable. Ability to set reminders as "Do not remind" or "No longer relevant".

Table 2: Areas for Improvement – Group A

Group B

Criteria/Module	Findings
(a)(5) Demographics	Fix consistency of design and functionality for form input fields. Not all drop-down menus look or function the same. Error messaging is too far from the input field. First "Remove" link for Ethnicity and Race is disabled but should be removed. Better instructions for form inputs. SO/GI checkbox groups should instruct user if it is single or multi-select.

Table 3: Areas for Improvement – Group B

Group C

Criteria/Module	Findings
(a)(14) Implantable device list	Make form inputs more consistent with similar inputs in the EHR or with industry standards. Most participants had trouble with the Imprecise Date Picker. Any form input that required the use of a dialog or widget was troublesome. For Imprecise Date Picker, participants wanted to type directly into the input without having to launch the date picker. Layout of the Add Implant Event form was confusing. Form labels were underneath the inputs which is not consistent with other forms in the EHR. Drop-down Menus do not have a function to clear the selection. Placement of tooltips hid menu options. Improve navigation of the CCDA review view. When user checks or unchecks a section, they are taken to the top of the CCDA preview.
(b)(2) Clinical information reconciliation and incorporation	Form inputs are not consistent in labeling or functionality. Liked the addition of a "reviewed" indicator and a Set All Reviewed button. Much faster and more usable than before. It was unusable before the updates. Looking forward to using. CCDA document can be too long and tricky to navigate

Table 4: Areas for Improvement – Group C

2.0   Introduction

The Office of the National Coordinator for Health Information Technology (ONC) Health IT Certification Program is a voluntary certification program established by the Office of the National Coordinator for Health IT to provide for the certification of health IT.

The Indian Health Service (IHS) Office of Information Technology (OIT) has requested that the Resource and Patient Management System Electronic Health Record (RPMS EHR) achieve ONC 2015 Health IT Certification. As part of the certification criteria, (g)(3) Safety-Enhanced Design requires that summative usability testing be performed on specific criteria and the test data be provided as part of a final test report. The test report will follow the National Institute of Standards and Technology (NIST) Customized Common Industry Format Template for Electronic Health Record Usability Testing (NISTIR 7742).

Summative usability testing is a task-based evaluation that measures the ease of use of a completed product. The results are analyzed and compared to the usability requirements to determine if those requirements have been met. Summative usability testing was conducted on RPMS Suite (BCER) v4.0. The intended users for this software include medical providers, nursing staff, health information management staff, pharmacy staff, and imaging and laboratory personnel at clinics and hospitals.

2.1   Purpose

The purpose of this test was to evaluate and validate each safety-enhanced design criterion and the associated capabilities. The test ensures that the completed product meets the 2015 CHIT certification requirements concerning user-centered design.

2.2   Scope

The scope of usability testing is limited to testing user-involved tasks. Automated tasks or tasks without user interaction are not covered in this test. Functional testing is not covered in detail. Functionality is only tested as it pertains to the usability of the product or feature being tested.

The test was limited in scope to the following criteria:

- 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 interaction checks

- 170.315 (a)(5) Demographics

- 170.315(a)(9) Clinical decision support

- 170.315(a)(14) Implantable Device List (IDL)

- 170.315(b)(2) Clinical Information Reconciliation and Incorporation (CIR)

3.0 Method

See Appendix A for Participant and Test data.

The test method and metrics were based on the NIST Guide to the Processes Approach for Improving the Usability of Electronic Health Records (NISTIR 7741). Modifications were made where necessary to better evaluate the application against the contract goals and requirements.

The objective of this test was to uncover areas where the application performed well and areas where the application failed to meet the usability 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 capability and/or comparison with other EHR capabilities provided the same tasks are used. This testing serves as both a means to record or benchmark current usability and to identify areas where improvements must be made.

The application was evaluated for effectiveness, efficiency and satisfaction as defined by measures collected and analyzed for each participant:

- Number of tasks successfully completed

- Time to complete the tasks

- Number and types of errors

- Path deviations

- Participant's verbalizations (comments)

- Participant's satisfaction ratings of the system (Task Satisfaction Rating)

    o 1 (Very Difficult) – 5 (Very Easy)

Testing for the criteria was broken down into 3 separate test groups as follows:

1. Test Group A – Existing Functionality

    - 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 interaction checks

- 170.315(a)(9) Clinical decision support

2. Test Group B – New Functionality

- 170.315(a)(5) Demographics

3. Test Group C – New Functionality

- 170.315(a)(14) Implantable Device List (IDL)

- 170.315(b)(2) Clinical Information Reconciliation and Incorporation (CIR)

3.1   Roles and Responsibilities

Role/Function	Responsibilities
Project Manager/Criteria Owner	Responsible for the management, monitoring and tracking of the project and oversees all areas.
Usability Test Lead / Test Administrator	• Ensures that usability testing is conducted successfully and meets all usability testing deadlines. • Provides application systems analysis for application testing activities. • Prepares required documentation at the program level for testing activities. • Monitors and escalates risks or concerns about achieving goals or meeting schedules to program leadership. • Prepares all testing instructions, scripts and materials for use in the testing session. • Performs analysis of testing results, prepares and delivers test report. • Moderates the test • Collects test data

Role/Function	Responsibilities
Test Observers	• Provide any needed training or support • Monitor the testing session
Test Participants	• Complete the assigned tasks • Provide honest feedback on their experience

Table 5: Roles and Responsibilities

3.1.1   Test Participants

The total number of test participants per round of testing is listed below:

1. Test Group A – (a)(1)-(4) & (a)(9)

    • 12 Test Participants

2. Test Group B – (a)(5)

    • 11 Test Participants

3. Test Group C – (a)(14) & (b)(2)

    • 11 Test Participants

 Participants in the test were:

• typical end-users such as physicians and medical providers

• trained to use the application prior to usability testing

• recruited by the 2015 CHIT project team and IHS criteria owners

• not compensated for participation

• had no direct connection to the development of the application

• given the same orientation and level of training as the actual end users

• assigned a participant ID initially based on scheduling order

Once participants were identified, they were scheduled for 60-minute one-on-one web conferencing (Skype, Adobe Connect) sessions. A calendar was used to keep track of the participants' schedule and a spreadsheet tracked participants' location (site) and contact information.

3.2 Test Location

The test was conducted remotely via the use of video conferencing and desktop sharing software (Microsoft Skype for Business, Adobe Connect).

3.3 Test Environment

The test participants were:

- physically located at their normal duty stations;

- logged into the RPMS EHR platform connected to a test database;

- utilizing their assigned workstation computers with a Windows operating system, a modern computer screen, a minimum screen resolution of 1024x768, and default color settings;

- interacting with the application with a mouse and keyboard; and

- connected to the video conferencing software via a Wide Area Network (WAN).

The test administrator and observers were also physically distributed and connected via video conferencing software.

For Test Group A, the test participants shared their screens and were the only desktops visible during testing. For Test Groups B and C, the test administrator shared his screen and participants were given control of the test application through the test administrator's screen.

In the case of Test Group B and C, the technical system performance (i.e., response time) was not representative to what actual users would experience in a field implementation, as they were working through the test administrator's workstation and not their own.

3.4 Test Tools

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

1. Demographic Questionnaire

2. Moderator's Guide

3. Post-test Questionnaire

The Moderator's Guide was devised so as to capture the required data.

Video conferencing software (MS Skype, Adobe Connect) was used to connect participants, the administrator and observers. This software was also used to record the video and audio of test sessions.

3.5   Tasks

The testing scenarios and tasks were constructed to be realistic and representative of the kinds of activities a user would perform using the capabilities being tested. Tasks were chosen with the test objectives in mind to ensure that participants provided the most meaningful data possible. The tasks were arranged to simulate a normal patient visit.

The following is the order in which the tasks were administered:

- 170.315(a)(9) Clinical decision support
    1. Access Clinical Reminders List.
    2. Select a reminder and view details.
    3. Resolve the reminder.
    4. Refresh the Clinical Reminders list and confirm that the reminder has been resolved.

- 170.315(a)(1) Computerized provider order entry—medications, 170.315(a)(4) Drug-drug, drug-allergy interaction checks
    1. Access the patient's Orders List.
    2. Place order for Warfarin. Accept and sign the order. Refresh the list and view that the order has been added. (Successful order test.)
    3. Place order for Penicillin. Accept but do not sign the order. Confirm that the order has been added. (Test trigger for a drug-allergy alert.)
    4. Change the Penicillin order to Erythromycin. (Test trigger for drug-drug interaction alert.)
    5. Accept and sign order. Confirm that the order has been added. (Test justification for bypassing the alert.)

- 170.315(a)(2) Computerized provider order entry—laboratory
    1. Access the patient's Orders List.
    2. Place HgbA1c lab order. Accept but do not sign the order. Confirm that the order has been added.
    3. Change the collection date of the HgbA1c order. Accept and sign the order.

- 170.315(a)(3) Computerized provider order entry—diagnostic imaging
    1. Access patient's Orders List.
    2. Place order for x-ray of left ankle. Accept but do not sign the order. Confirm that the order has been added.
    3. Change the Transport method to Stretcher. Accept and sign the order.

- 170.315(a)(5) Demographics
    1. Register New Patient
    2. Add Preferred Language to Existing Patient
    3. Edit Patient Information
    4. Add SO/GI Information

    5. Edit SO/GI Information

    6. Update Preliminary Cause of Death

- 170.315(a)(14) Implantable Device List
    1. Add New Implantable Device
    2. Access and change UDI and Status
    3. Preview a list that contains UDIs, description, and method to access UDIs

- 170.315(b)(2) Clinical Information Reconciliation and Incorporation
    1. Reconcile CCDA Problems
    2. Reconcile CCDA Adverse Reactions
    3. Reconcile CCDA Medications
    4. Preview new CCDA with reconciled data

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

3.6 Procedure

Upon arrival, each participant was greeted by the administrator and matched to a name on the participant schedule. The participant was then assigned a participant ID.

The test administrator moderated the test session including administering instructions and tasks. The administrator also monitored task times, obtained post-task rating data, and took notes on participant comments.

Each participant was instructed to perform the tasks:

- As quickly as possible making as few errors and deviations as possible.

- Without assistance; administrators were allowed to give immaterial guidance and clarification on tasks, but not instructions on use.

Testing for the criteria was broken down into 3 separate test groups as follows:

1. Test Group A – Existing Functionality (a)(1)-(4); (a)(9)

2. Test Group B – New Functionality – (a)(5) Demographics

3. Test Group C – New Functionality – (a)(14) Implantable Device List (IDL) and (b)(2) Clinical Information Reconciliation and Incorporation (CIR)

Each participant per Test Group used the same application version and was provided with the same set of instructions.

For Test Group A, the administrator instructed participants to log into the application as specific user types. For Test Groups B and C, the administrator logged into the test environment and then instructed the user to request control. After log in, the user was instructed to complete a series of tasks (given one at a time) using the application.

Task timing began once the administrator finished reading the question. The task time was stopped once the participant indicated that the task was successfully completed.

Scoring is discussed in [Section 3.7 Usability Metrics](#).

After completion of the testing tasks, the administrator gave the participant a post-test questionnaire (System Usability Scale), asked if they had any questions, and thanked them for their participation.

Each participant's demographic information, task success rate, time on task, errors, deviations, verbal responses, and post-test questionnaire ratings were recorded into the participant spreadsheet.

Following each test session, the video recordings were reviewed and checked against the data logged in the participant spreadsheet. The participant spreadsheet was updated with any edits or additional information such as verbalizations.

3.7   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 by measuring participant success rates and errors

2. Efficiency by measuring the average task time and path deviations

3. Satisfaction by measuring task satisfaction ratings and SUS scores

3.7.1 Data Scoring

The following table (Table 6) details how tasks were scored, errors evaluated, and the time data analyzed.

Measures	Rationale and Scoring
Effectiveness: Task Success	A task was counted as a "Success" if the participant was able to achieve the correct outcome, without assistance, within the time allotted on a per task basis. The total number of successes were calculated for each task and then divided by the total number of times that task was attempted. The results are provided as a percentage. Task times were recorded for successes. Observed task times divided by the optimal time for each task is a measure of optimal efficiency. Optimal task performance time, as benchmarked by expert performance under realistic conditions, is recorded when constructing tasks. Target task times used for task times in the Moderator's Guide must be operationally defined by taking multiple measures of optimal performance and multiplying by some factor [e.g., 1.25] that allows some time buffer because the participants are presumably not trained to expert performance. Thus, if expert, optimal performance on a task was [x] seconds then allotted task time performance was [x * 1.25] seconds. This ratio should be aggregated across tasks and reported with mean and variance scores.
Effectiveness: Task Failures	If the participant abandoned the task, did not reach the correct answer or performed it incorrectly, or reached the end of the allotted time before successful completion, the task was counted as a "Failures." No task times were taken for errors. The total number of errors was calculated for each task and then divided by the total number of times that task was attempted. Not all deviations would be counted as errors.[11] This should also be expressed as the mean number of failed tasks per participant. On a qualitative level, an enumeration of errors and error types should be collected.
Efficiency: Task 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.

Measures	Rationale and Scoring
Satisfaction: **Task Satisfaction Rating**	Participant's subjective impression of the ease of use of the application was measured by administering both a simple post-task question as well as a post-session questionnaire. After each task, the participant was asked to rate "Overall, this task was:" on a scale of 1 (Very Difficult) to 5 (Very Easy). These data are averaged across participants. Common convention is that average ratings for systems judged easy to use should be 3.3 or above. To measure participants' confidence in and likeability of the system overall, the testing team administered the System Usability Scale (SUS) post-test questionnaire. Questions included, "I think I would like to use this system frequently," "I thought the system was easy to use," and "I would imagine that most people would learn to use this system very quickly."

Table 6: Measure Scoring

4.0   Results

4.1   Data Analysis and Reporting

The results of the usability test were calculated according to the methods specified in the Usability Metrics section above.

Participants who failed to follow session and task instructions had their data excluded from the analyses.

4.2   Discussion of Findings

Based on the score of the Task Satisfaction Rating, the participants found the EHR easy to use. Participants did state that the initial learning curve is steep and training is necessary. However, once they learned to use the application, participants completed tasks with great efficiency and effectiveness.

The path taken to complete the tasks differed from participant to participant. This was influenced by the differing configuration of the test sites' EHR UIs. In spite of the varied paths to complete tasks, time per task was minimal and consistent, and errors were virtually non-existent.

All test participants felt the components were consistent and functioned as expected. The majority found the RPMS EHR to be an effective tool for completing their work tasks. Most said they would recommend this EHR to their colleagues.

The top issues the test participants remarked on were:

- Training

    o   More training is needed.

    o   Better training is needed.

    o   Training should be updated and offered on a more consistent basis.

- UI Configuration

    o   All felt the ability to customize the EHR UI to be a strength and that many issues they had with the system could be resolved with configuration updates.

    o   Participants wanted more input on how the EHR UI is configured. Users felt locked into their current EHR configuration.

- o While some liked the many ways to complete a given task and others did not, most agreed that it was unnecessarily redundant and added to confusion.

- Form Instructions and Elements

  - o All participants liked the overall consistency of the EHR UI.

  - o Better guidance on required fields in the ordering process.

  - o Interface and interface elements are cramped, especially if the view port cannot be resized.

  - o The default sizing of many windows, panels and lists does not allow the information they contain to be seen. This renders them useless until being resized, which leads to repeatedly having to adjust displays in order to use them.

  - o Windows, panels and lists were inconsistent in their ability to be resized. Participants felt that all displays should allow resizing and should retain any adjustments made to them.

4.2.1   Effectiveness

4.2.1.1   Group A

- 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 interaction checks

- 170.315 (a)(9) Clinical decision support

#	Tasks - Group A	# Participants	Task Success Rate - Mean %	Task Success Rate - Std Dev %	Task Errors Mean %	Task Errors Std Dev %
	170.315(a)(9) Clinical decision support					
1	Access Clinical Reminders List.	12	100%	0%	0%	0%
2	Select a reminder and view details.	12	100%	0%	0%	0%
3	Resolve the reminder.	12	100%	0%	0%	0%
4	Refresh the Clinical Reminders list and confirm that the reminder has been resolved.	12	100%	0%	0%	0%
	170.315(a)(1) Computerized provider order entry—medications & **170.315(a)(4) Drug-drug, drug-allergy interaction checks**					
5	Access the patient's Orders List.	12	100%	0%	0%	0%
6	Place order for Warfarin. Accept and sign the order. Refresh the list and view that the order has been added. (Successful order test)	12	100%	0%	0%	0%
7	Place order for Penicillin. Accept but do not sign the order. Confirm that the order has been added. (Test trigger for a drug-allergy alert)	12	100%	0%	0%	0%
8	Change the Penicillin order for to Erythromycin. (Test trigger for drug-drug interaction alert)	12	100%	0%	0%	0%
9	Accept and sign order. Confirm that the order has been added. (Test justification for bypassing the alert)	12	100%	0%	0%	0%
	170.315(a)(2) Computerized provider order entry—laboratory					
10	Access the patient's Orders List.	12	100%	0%	0%	0%
11	Place HgbA1c lab order. Accept but do not sign the order. Confirm that the order has been added.	12	100%	0%	0%	0%
12	Change the collection date of the HgbA1c order. Accept and sign the order.	12	100%	0%	0%	0%
	170.315(a)(3) Computerized provider order entry—diagnostic imaging					
13	Access patient's Orders List.	12	92%	29%	0%	0%
14	Place order for x-ray of left ankle. Accept but do not sign the order. Confirm that the order has been added.	12	92%	29%	0%	0%
15	Change the Transport method to Stretcher. Accept and sign the order.	12	92%	29%	0%	0%

Table 7: Effectiveness – Group A

4.2.1.2 Group B

- 170.315(a)(5) Demographics

#	Tasks - Group B	# Participants	Task Success Rate - Mean %	Task Success Rate - Std Dev %	Task Errors Mean %	Task Errors Std Dev %
	170.315(a)(5) Demographics					
1	Register New Patient	11	100%	0%	0%	0%
2	Add Preferred Language to Existing Patient	11	100%	0%	0%	0%
3	Edit Patient Information	11	100%	0%	9%	30%
4	Add SO/GI Information	11	100%	0%	0%	0%
5	Edit SO/GI Information	11	100%	0%	0%	0%
6	Update Preliminary Cause of Death	11	100%	0%	0%	0%

Table 8: Effectiveness – Group B

4.2.1.3 Group C

- 170.315(a)(14) Implantable Device List (IDL)

- 170.315(b)(2) Clinical Information Reconciliation and Incorporation (CIR)

#	Tasks - Group C	# Participants	Task Success Rate - Mean %	Task Success Rate - Std Dev %	Task Errors Mean %	Task Errors Std Dev %
	170.315(a)(14) IDL					
1	Add New Implantable Device	11	91%	30%	0%	0%
2	Access and change UDI and Status	11	82%	40%	0%	0%
3	Preview a list that contains UDIs, description and method to access UDIs	11	91%	30%	0%	0%
	170.315(b)(2) CIR					
4	Reconcile CCDA Problems	11	100%	0%	9%	30%
5	Reconcile CCDA Adverse Reactions	11	100%	0%	9%	30%
6	Reconcile CCDA Medications	11	100%	0%	0%	0%
7	Preview new CCDA with reconciled data	11	91%	30%	0%	0%

Table 9: Effectiveness – Group C

4.2.2   Efficiency

4.2.2.1   Group A

#	Tasks - Group A	Observed # Steps	Optimal # Steps	Task Time Observed Mean (seconds)	Task Time Std Dev (seconds)	Task Time Optimal (seconds)
	170.315(a)(9) Clinical decision support					
1	Access Clinical Reminders List.	2	2	7	4	3
2	Select a reminder and view details.	3	3	12	4	7
3	Resolve the reminder.	4	4	46	21	15
4	Refresh the Clinical Reminders list and confirm that the reminder has been resolved.	2	2	7	5	3
	170.315(a)(1) Computerized provider order entry—medications & 170.315(a)(4) Drug-drug, drug-allergy interaction checks					
5	Access the patient's Orders List.	2	2	5	1	3
6	Place order for Warfarin. Accept and sign the order. Refresh the list and view that the order has been added. (Successful order test)	12	12	71	31	43
7	Place order for Penicillin. Accept but do not sign the order. Confirm that the order has been added. (Test trigger for a drug-allergy alert)	14	14	45	6	41
8	Change the Penicillin order for to Erythromycin. (Test trigger for drug-drug interaction alert)	14	14	55	10	43
9	Accept and sign order. Confirm that the order has been added. (Test justification for bypassing the alert)	5	5	35	11	22
	170.315(a)(2) Computerized provider order entry—laboratory					
10	Access the patient's Orders List.	2	2	4	2	1
11	Place HgbA1c lab order. Accept but do not sign the order. Confirm that the order has been added.	6	6	47	8	40
12	Change the collection date of the HgbA1c order. Accept and sign the order.	5	5	38	7	32

#	Tasks - Group A	Observed # Steps	Optimal # Steps	Task Time Observed Mean (seconds)	Task Time Std Dev (seconds)	Task Time Optimal (seconds)
	170.315(a)(3) Computerized provider order entry—diagnostic imaging					
13	Access patient's Orders List.	2	2	4	3	2
14	Place order for x-ray of left ankle. Accept but do not sign the order. Confirm that the order has been added.	6	6	50	24	27
15	Change the Transport method to Stretcher. Accept and sign the order.	5	5	20	7	23

Table 10: Efficiency – Group A

4.2.2.2 Group B

#	Tasks - Group B	Observed # Steps	Optimal # Steps	Task Time Observed Mean (seconds)	Task Time Std Dev (seconds)	Task Time Optimal (seconds)
	170.315(a)(5) Demographics					
1	Register New Patient	16	15	282	105	216
2	Add Preferred Language to Existing Patient	11	10	73	29	53
3	Edit Patient Information	8	7	83	38	52
4	Add SO/GI Information	8	7	57	34	43
5	Edit SO/GI Information	7	7	50	18	35
6	Update Preliminary Cause of Death	13	12	74	29	108

Table 11: Efficiency – Group B

4.2.2.3 Group C

#	Tasks - Group C	Observed # Steps	Optimal # Steps	Task Time Observed Mean (seconds)	Task Time Std Dev (seconds)	Task Time Optimal (seconds)
	170.315(a)(14) IDL					
1	Add New Implantable Device	0.35	261	255	135	253
2	Access and change UDI and Status	0	61	61	55	28
3	Preview a list that contains UDIs, description and method to access UDIs	0	40	41	28	28
	170.315(b)(2) CIR					
4	Reconcile CCDA Problems	0.2	120	139	87	100
5	Reconcile CCDA Adverse Reactions	0.7	142	158	93	122
6	Reconcile CCDA Medications	0.35	122	129	55	76
7	Preview new CCDA with reconciled data	0.15	116	115	74	153

Table 12: Efficiency – Group C

4.2.3   Satisfaction

4.2.3.1   Group A

#	Tasks - Group A	# Participants	Task Rating Likert Scale	Task Rating Mean	Task Rating Std Dev
	170.315(a)(9) Clinical decision support				
1	Access Clinical Reminders List.	12	1-5	5	0
2	Select a reminder and view details.	12	1-5	5	0
3	Resolve the reminder.	12	1-5	5	0
4	Refresh the Clinical Reminders list and confirm that the reminder has been resolved.	12	1-5	5	0
	170.315(a)(1) Computerized provider order entry— medications & 170.315(a)(4) Drug-drug, drug-allergy interaction checks				
5	Access the patient's Orders List.	12	1-5	4.67	0.78
6	Place order for Warfarin. Accept and sign the order. Refresh the list and view that the order has been added. (Successful order test)	12	1-5	4.67	0.78
7	Place order for Penicillin. Accept but do not sign the order. Confirm that the order has been added. (Test trigger for a drug-allergy alert)	12	1-5	4.67	0.78
8	Change the Penicillin order for to Erythromycin. (Test trigger for drug-drug interaction alert)	12	1-5	4.67	0.78
9	Accept and sign order. Confirm that the order has been added. (Test justification for bypassing the alert)	12	1-5	4.67	0.78
	170.315(a)(2) Computerized provider order entry— laboratory				
10	Access the patient's Orders List.	12	1-5	4.83	0.58
11	Place HgbA1c lab order. Accept but do not sign the order. Confirm that the order has been added.	12	1-5	4.83	0.58
12	Change the collection date of the HgbA1c order. Accept and sign the order.	12	1-5	4.83	0.58
	170.315(a)(3) Computerized provider order entry— diagnostic imaging				
13	Access patient's Orders List.	12	1-5	4.67	1.15
14	Place order for x-ray of left ankle. Accept but do not sign the order. Confirm that the order has been added.	12	1-5	4.67	1.15
15	Change the Transport method to Stretcher. Accept and sign the order.	12	1-5	4.67	1.15

Table 13: Satisfaction – Group A

4.2.3.2   Group B

#	Tasks - Group B	# Participants	Task Rating Likert Scale	Task Rating Mean	Task Rating Std Dev
	170.315(a)(5) Demographics				
1	Register New Patient	11	1-5	4.82	0.60
2	Add Preferred Language to Existing Patient	11	1-5	4.82	0.60
3	Edit Patient Information	11	1-5	4.82	0.60
4	Add SO/GI Information	11	1-5	5.00	0.00
5	Edit SO/GI Information	11	1-5	5.00	0.00
6	Update Preliminary Cause of Death	11	1-5	5.00	0.00

Table 14: Satisfaction – Group B

4.2.3.3   Group C

#	Tasks - Group C	# Participants	Task Rating Likert Scale	Task Rating Mean	Task Rating Std Dev
	170.315(a)(14) IDL				
1	Add New Implantable Device	11	1-5	4.09	1.38
2	Access and change UDI and Status	11	1-5	3.91	1.64
3	Preview a list that contains UDIs, description and method to access UDIs	11	1-5	4.64	1.21
	170.315(b)(2) CIR				
4	Reconcile CCDA Problems	11	1-5	4.82	0.6
5	Reconcile CCDA Adverse Reactions	11	1-5	4.45	0.93
6	Reconcile CCDA Medications	11	1-5	4.82	0.6
7	Preview new CCDA with reconciled data	11	1-5	4.64	1.21

Table 15: Satisfaction – Group C

4.2.3.4 System Usability Scale (SUS)

The results from the System Usability Scale (SUS) from the post-test questionnaire, scored the subjective satisfaction with the system based on performance with the listed testing tasks by group.

System Usability Scale (SUS) Score	Score
Group A (a)(1)-(4); (a)(9)	73.13
Group B (a)(5)	90.68
Group C (a)(14) & (b)(2)	87.05

Table 16: SUS Scores

According to usability.gov, "[b]ased on research, a SUS score above a 68 would be considered above average and anything below 68 is below average".

4.2.4 Major Findings

4.2.4.1 Group A

Criteria/Module	Findings
(a)(1) CPOE – medications	All liked the Quick Order menus. Very valuable tool.
(a)(2) CPOE – laboratory	Easy to use. Consistent workflow.
(a)(3) CPOE – diagnostic imaging	Easy to use. Does not follow a logical tab order.
(a)(4) Drug-drug, drug-allergy interaction checks for CPOE	Some found the alerts to be too frequent and of little use. They can be bypassed and ignored. Alert fatigue causes some to turn it off completely.
(a)(9) Clinical decision support	Useful. Not flexible enough to be used beyond a limited set of functionalities. Needs more customization options. Great when it works but difficult to troubleshoot.

Table 17: Major Findings – Group A

4.2.4.2 Group B

Criteria/Module	Findings
(a)(5) Demographics	Participants liked that more than 1 ethnicity and race could be selected, as well as how many more options are available for ethnicity and race. Participants did not like the inconsistency of the form inputs. Overall, test participants found the criteria capabilities usable.

Table 18: Major Findings – Group B

4.2.4.3   Group C

Criteria/Module	Findings
(a)(14) Implantable device list	Nearly all test participants were new to this functionality. Even without experience, participants were able to successfully complete complex tasks. Usability can be improved. Form inputs are not consistent with similar inputs in the EHR or with industry standards. Most participants had trouble with the Imprecise Date Picker.
(b)(2) Clinical information reconciliation and incorporation	Form inputs are not consistent in labeling or functionality. Liked the addition of a "reviewed" indicator and a Set All Reviewed button. Much faster and more usable than before. It was unusable before the updates. Looking forward to using. CCDA document can be too long and tricky to navigate.

Table 19: Major Findings – Group C

4.2.5   Areas for Improvement

4.2.5.1   Group A

Criteria/Module	Findings
(a)(1) CPOE – medications	Clinical Indication box under Medication Order -- if a provider has not already added a diagnosis to the problem list and they search for it here, it does not also save to the problem list; this causes some providers frustration. Participants did not like that if POV is not added for acute visit, they have to go to dropdown menu and select what the medicine is treating.
(a)(2) CPOE – laboratory	'Order a Lab Test' screen – when a provider is searching a 'clinical indication' but has not added it to the problem list, there is no additional option to add it to the problem list from this screen.
(a)(3) CPOE – diagnostic imaging	Fix tab order of form fields. Improve form field labeling.
(a)(4) Drug-drug, drug-allergy interaction checks for CPOE	Would like to see a hard stop for alerts, something interactive that providers would have to read and acknowledge they have done before continuing. Better configuration for alerts to reduce alert fatigue.
(a)(9) Clinical decision support	Better training available on demand. Better documentation and training on troubleshooting procedures. Nurses have commented that they would like the capability to complete the note/dialogue associated with the reminder from the "Available Reminders" pop up box. Needs to be more flexible of configurable. Ability to set reminders as "Do not remind" or "No longer relevant".

Table 20: Areas for Improvement – Group A

4.2.5.2   Group B

Criteria/Module	Findings
(a)(5) Demographics	Fix consistency of design and functionality for form input fields. Not all drop-down menus look or function the same. Error messaging is too far from the input field. First "Remove" link for Ethnicity and Race is disabled but should be removed. Better instructions for form inputs. SO/GI checkbox groups should instruct user if it is single or multi-select.

Table 21: Areas for Improvement – Group B

4.2.5.3   Group C

Criteria/Module	Findings
(a)(14) Implantable device list	Make form inputs more consistent with similar inputs in the EHR or with industry standards. Most participants had trouble with the Imprecise Date Picker. Any form input that required the use of a dialog or widget was troublesome. For Imprecise Date Picker, participants wanted to type directly into the input without having to launch the date picker. Layout of the Add Implant Event form was confusing. Form labels were underneath the inputs which is not consistent with other forms in the EHR. Drop-down Menus do not have a function to clear the selection. Placement of tooltips hid menu options. Improve navigation of the CCDA review view. When user checks or unchecks a section, they are taken to the top of the CCDA preview.
(b)(2) Clinical information reconciliation and incorporation	Form inputs are not consistent in labeling or functionality. Liked the addition of a "reviewed" indicator and a Set All Reviewed button. Much faster and more usable than before. It was unusable before the updates. Looking forward to using. CCDA document can be too long and tricky to navigate

Table 22: Areas for Improvement – Group C

5.0   Acronym List

Acronym	Description
EHR	Electronic Health Record
CHIT	Certified Health Information Technology
UI	User Interface
IHS	Indian Health Service
ISO	International Organization for Standardization
NIST	National Institute of Standards and Technology
OIT	Office of Information Technology
RPMS	Resource and Patient Management System
SESS	Software Engineering Support Services

Table 23: Acronyms

6.0   Appendix A: Participant and Test Result Data

Participant Identifier	Participant Gender	Participant Age	Participant Education	Participant Occupation/Role	Participant Professional Experience (months)	Participant Computer Experience (months)	Participant Product Experience (months)	Participant Assistive Technology Needs
Group A - 14	Female	30-39	Doctorate degree	General Pediatrician	24	25	24	No
Group A - 1	Female	40-49	Master's degree	Registered Nurse/Case Manager	168	60	96	No
Group A - 12	Female	30-39	Doctorate and Master's degree	Clinical Applications Coordinator	120	60	120	No
Group A - 11	Male	30-39	Master's degree	Chief of Staff, Physician Assistant/Informatics	48	60	48	No
Group A - 8	Female	30-39	Doctorate degree	Clinical Informaticist	168	25	168	No
Group A - 3	Male	30-39	Doctorate degree	Clinical Informaticist	144	60	144	No
Group A - 4	Female	40-49	Doctorate degree	Clinical Applications Coordinator	240	60	240	No
Group A - 13	Male	40-49	Doctorate degree	Clinical Informaticist	180	60	204	No
Group A - 7	Female	30-39	Doctorate degree	Family Medicine Physician	24	25	24	No
Group A - 15	Male	50-59	Doctorate degree	Physician	120	60	120	No
Group A - 6	Male	40-49	Doctorate and Master's degree	Clinical Informaticist	360	60	360	No
Group A - 9	Female	40-49	Bachelor's degree	Nurse Informaticist	252	60	252	No
Group B - 2	Female	30-39	Bachelor's degree	Business Office Manager	72	60	72	No
Group B - 10	Male	30-39	Associate degree	IT Specialist	192	60	180	No
Group B - 5	Male	50-59	Associate degree	IT Specialist, CAC	216	60	192	No
Group B - 7	Female	40-49	Bachelor's degree	Supervisory Health Systems Specialist	228	25	228	No
Group B - 8	Female	30-39	Some college credit, no degree; Trade/technical/vocational training	MSA	12	25	12	No
Group B - 1	Female	30-39	Associate degree	Registration Supervisor	24	25	24	No
Group B - 9	Female	20-29	Some college credit, no degree	MSA	9	25	9	No
Group B - 11	Female	40-49	high school graduate, diploma or the equivalent	Administrative Support Assistant	96	25	96	No
Group B - 6	Female	40-49	Some college credit, no degree	Supervisory Medical Support Assistant	144	60	144	No
Group B - 12	Female	40-49	Associate Degree	Supervisory Medical Support Assistant	120	25	120	No
Group B – 3	Female	40-49	Some college credit, no degree	IT Specialist/Application Coordinator	240	60	240	No
Group C - 6	Male	40-49	Doctorate and Master's degree	Clinical Informaticist	360	60	360	No
Group C - 9	Female	40-49	Bachelor's degree	Nurse Informaticist	252	60	252	No
Group C - 8	Female	30-39	Doctorate degree	Clinical Informaticist	168	25	168	No
Group C - 5	Female	60-69	Master's degree	Clinical Application Coordinator	240	60	240	No
Group C - 14	Female	30-39	Doctorate degree	General Pediatrician	24	25	24	No
Group C - 13	Male	40-49	Doctorate degree	Clinical Informaticist	180	60	204	No

Participant Identifier	Participant Gender	Participant Age	Participant Education	Participant Occupation/Role	Participant Professional Experience (months)	Participant Computer Experience (months)	Participant Product Experience (months)	Participant Assistive Technology Needs
Group C - 20	Male	40-49	Doctorate degree	Health Systems Analyst	120	60	120	No
Group C - 17	Male	30-39	Doctorate degree	Physician/Medical Officer	72	60	72	No
Group C - 10	Male	50-59	Associate degree	IT Specialist, Clinical Application Coordinator	216	60	108	No
Group C - 19	Male	30-39	Doctorate degree	Clinical Informaticist	132	60	132	No
Group C - 2	Female	30-39	Bachelor's degree	Supervisory Clinical Nurse	96	60	96	No

Test Group	Task	Task Success Rate - Mean (%)	Task Success Rate - Standard Deviation (%)	Mean observed number of steps taken for the corresponding task	Optimal number of steps for the corresponding task
	170.315(a)(9) Clinical decision support				
A	1. Access Clinical Reminders List.	100%	0%	2	2
A	2. Select a reminder and view details.	100%	0%	3	3
A	3. Resolve the reminder.	100%	0%	4	4
A	4. Refresh the Clinical Reminders list and confirm that the reminder has been resolved.	100%	0%	2	2
A	**170.315(a)(1) Computerized provider order entry—medications, 170.315(a)(4) Drug-drug, drug-allergy interaction checks**				
A	5. Access the patient's Orders List.	100%	0%	2	2
A	6. Place order for Warfarin. Accept and sign the order. Refresh the list and view that the order has been added. (Successful order test)	100%	0%	12	12
A	7. Place order for Penicillin. Accept but do not sign the order. Confirm that the order has been added. (Test trigger for a drug-allergy alert)	100%	0%	14	14
A	8. Change the Penicillin order for to Erythromycin. (Test trigger for drug-drug interaction alert)	100%	0%	14	14
A	9. Accept and sign order. Confirm that the order has been added. (Test justification for bypassing the alert)	100%	0%	5	5
A	**170.315(a)(2) Computerized provider order entry—laboratory**				
A	10. Access the patient's Orders List.	100%	0%	2	2
A	11. Place HgbA1c lab order. Accept but do not sign the order. Confirm that the order has been added.	100%	0%	6	6
A	12. Change the collection date of the HgbA1c order. Accept and sign the order.	100%	0%	5	5
A	**170.315(a)(3) Computerized provider order entry—diagnostic imaging**				
A	13. Access patient's Orders List.	92%	29%	2	2
A	14. Place order for x-ray of left ankle. Accept but do not sign the order. Confirm that the order has been added.	92%	29%	6	6
A	15. Change the Transport method to Stretcher. Accept and sign the order.	92%	29%	5	5

Test Group	Task	Task Success Rate - Mean (%)	Task Success Rate - Standard Deviation (%)	Mean observed number of steps taken for the corresponding task	Optimal number of steps for the corresponding task
B	**170.315(a)(5) Demographics**				
B	1. Register New Patient	100%	0%	16	15
B	2. Add Preferred Language to Existing Patient	100%	0%	11	10
B	3. Edit Patient Information	100%	0%	8	7
B	4. Add SO/GI Information	100%	0%	8	7
B	5. Edit SO/GI Information	100%	0%	7	7
B	6. Update Preliminary Cause of Death	100%	0%	13	12
C	**170.315(a)(14) IDL**				
C	1. Add New Implantable Device	91%	30%	16	15
C	2. Access and change UDI and Status	82%	40%	6	6
C	3. Preview a list that contains UDIs, description, and method to access UDIs	91%	30%	5	5
C	**170.315(b)(2) CIR**				
C	4. Reconcile CCDA Problems	100%	0%	11	10
C	5. Reconcile CCDA Adverse Reactions	100%	0%	14	12
C	6. Reconcile CCDA Medications	100%	0%	16	15
C	7. Preview new CCDA with reconciled data	91%	30%	5	5

Task	Mean Task Time (seconds)	Standard Deviation for Task Time (seconds)	Observed Task Time (seconds)	Optimal Task Time (seconds)
170.315(a)(9) Clinical decision support				
1. Access Clinical Reminders List.	7	4	8	3
2. Select a reminder and view details.	12	4	8	7
3. Resolve the reminder.	46	21	38	15
4. Refresh the Clinical Reminders list and confirm that the reminder has been resolved.	7	5	5	3
170.315(a)(1) Computerized provider order entry—medications, 170.315(a)(4) Drug-drug, drug-allergy interaction checks				
5. Access the patient's Orders List.	5	1	5	3
6. Place order for Warfarin. Accept and sign the order. Refresh the list and view that the order has been added. (Successful order test)	71	31	45	43
7. Place order for Penicillin. Accept but do not sign the order. Confirm that the order has been added. (Test trigger for a drug-allergy alert)	45	6	42	41
8. Change the Penicillin order for to Erythromycin. (Test trigger for drug-drug interaction alert)	55	10	44	43
9. Accept and sign order. Confirm that the order has been added. (Test justification for bypassing the alert)	35	11	24	22
170.315(a)(2) Computerized provider order entry—laboratory				
10. Access the patient's Orders List.	4	2	2	1
11. Place HgbA1c lab order. Accept but do not sign the order. Confirm that the order has been added.	47	8	42	40
12. Change the collection date of the HgbA1c order. Accept and sign the order.	38	7	34	32
170.315(a)(3) Computerized provider order entry—diagnostic imaging				
13. Access patient's Orders List.	4	3	3	2
14. Place order for x-ray of left ankle. Accept but do not sign the order. Confirm that the order has been added.	50	24	51	27
15. Change the Transport method to Stretcher. Accept and sign the order.	20	7	27	23
170.315(a)(5) Demographics				
1. Register New Patient	282	105	223	216
2. Add Preferred Language to Existing Patient	73	29	58	53
3. Edit Patient Information	83	38	53	52
4. Add SO/GI Information	57	34	47	43
5. Edit SO/GI Information	50	18	37	35
6. Update Preliminary Cause of Death	74	29	113	108

Task	Mean Task Time (seconds)	Standard Deviation for Task Time (seconds)	Observed Task Time (seconds)	Optimal Task Time (seconds)
170.315(a)(14) IDL				
1. Add New Implantable Device	255	135	263	253
2. Access and change UDI and Status	61	55	35	28
3. Preview a list that contains UDIs, description, and method to access UDIs	41	28	30	28
170.315(b)(2) CIR				
4. Reconcile CCDA Problems	139	87	101	100
5. Reconcile CCDA Adverse Reactions	158	93	130	122
6. Reconcile CCDA Medications	129	55	77	76
7. Preview new CCDA with reconciled data	115	74	154	153

Task	Mean Task Errors (%)	Standard Deviation of Task Errors (%)
170.315(a)(9) Clinical decision support		
1. Access Clinical Reminders List.	0%	0%
2. Select a reminder and view details.	0%	0%
3. Resolve the reminder.	0%	0%
4. Refresh the Clinical Reminders list and confirm that the reminder has been resolved.	0%	0%
170.315(a)(1) Computerized provider order entry—medications, 170.315(a)(4) Drug-drug, drug-allergy interaction checks		
5. Access the patient's Orders List.	0%	0%
6. Place order for Warfarin. Accept and sign the order. Refresh the list and view that the order has been added. (Successful order test)	0%	0%
7. Place order for Penicillin. Accept but do not sign the order. Confirm that the order has been added. (Test trigger for a drug-allergy alert)	0%	0%
8. Change the Penicillin order for to Erythromycin. (Test trigger for drug-drug interaction alert)	0%	0%
9. Accept and sign order. Confirm that the order has been added. (Test justification for bypassing the alert)	0%	0%
170.315(a)(2) Computerized provider order entry—laboratory		
10. Access the patient's Orders List.	0%	0%
11. Place HgbA1c lab order. Accept but do not sign the order. Confirm that the order has been added.	0%	0%
12. Change the collection date of the HgbA1c order. Accept and sign the order.	0%	0%
170.315(a)(3) Computerized provider order entry—diagnostic imaging		
13. Access patient's Orders List.	0%	0%
14. Place order for x-ray of left ankle. Accept but do not sign the order. Confirm that the order has been added.	0%	0%
15. Change the Transport method to Stretcher. Accept and sign the order.	0%	0%
170.315(a)(5) Demographics		
1. Register New Patient	0%	0%
2. Add Preferred Language to Existing Patient	0%	0%
3. Edit Patient Information	9%	30%
4. Add SO/GI Information	0%	0%
5. Edit SO/GI Information	0%	0%
6. Update Preliminary Cause of Death	0%	0%

Task	Mean Task Errors (%)	Standard Deviation of Task Errors (%)
170.315(a)(14) IDL		
1. Add New Implantable Device	0%	0%
2. Access and change UDI and Status	0%	0%
3. Preview a list that contains UDIs, description, and method to access UDIs	0%	0%
170.315(b)(2) CIR		
4. Reconcile CCDA Problems	9%	30%
5. Reconcile CCDA Adverse Reactions	9%	30%
6. Reconcile CCDA Medications	0%	0%
7. Preview new CCDA with reconciled data	0%	0%

Task	Task Rating - Scale Type	Mean Task Rating (1-5)	Mean Task Rating Standard Deviation (1-5)
170.315(a)(9) Clinical decision support			
1. Access Clinical Reminders List.	Likert Scale	5	0
2. Select a reminder and view details.	Likert Scale	5	0
3. Resolve the reminder.	Likert Scale	5	0
4. Refresh the Clinical Reminders list and confirm that the reminder has been resolved.	Likert Scale	5	0
170.315(a)(1) Computerized provider order entry—medications, 170.315(a)(4) Drug-drug, drug-allergy interaction checks			
5. Access the patient's Orders List.	Likert Scale	4.67	0.78
6. Place order for Warfarin. Accept and sign the order. Refresh the list and view that the order has been added. (Successful order test)	Likert Scale	4.67	0.78
7. Place order for Penicillin. Accept but do not sign the order. Confirm that the order has been added. (Test trigger for a drug-allergy alert)	Likert Scale	4.67	0.78
8. Change the Penicillin order for to Erythromycin. (Test trigger for drug-drug interaction alert)	Likert Scale	4.67	0.78
9. Accept and sign order. Confirm that the order has been added. (Test justification for bypassing the alert)	Likert Scale	4.67	0.78
170.315(a)(2) Computerized provider order entry—laboratory			
10. Access the patient's Orders List.	Likert Scale	4.83	0.58
11. Place HgbA1c lab order. Accept but do not sign the order. Confirm that the order has been added.	Likert Scale	4.83	0.58
12. Change the collection date of the HgbA1c order. Accept and sign the order.	Likert Scale	4.83	0.58
170.315(a)(3) Computerized provider order entry—diagnostic imaging			
13. Access patient's Orders List.	Likert Scale	4.67	1.15
14. Place order for x-ray of left ankle. Accept but do not sign the order. Confirm that the order has been added.	Likert Scale	4.67	1.15
15. Change the Transport method to Stretcher. Accept and sign the order.	Likert Scale	4.67	1.15

Task	Task Rating - Scale Type	Mean Task Rating (1-5)	Mean Task Rating Standard Deviation (1-5)
170.315(a)(5) Demographics			
1. Register New Patient	Likert Scale	4.82	0.60
2. Add Preferred Language to Existing Patient	Likert Scale	4.82	0.60
3. Edit Patient Information	Likert Scale	4.82	0.60
4. Add SO/GI Information	Likert Scale	5.00	0.00
5. Edit SO/GI Information	Likert Scale	5.00	0.00
6. Update Preliminary Cause of Death	Likert Scale	5.00	0.00
170.315(a)(14) IDL			
1. Add New Implantable Device	Likert Scale	4.09	1.38
2. Access and change UDI and Status	Likert Scale	3.91	1.64
3. Preview a list that contains UDIs, description, and method to access UDIs	Likert Scale	4.64	1.21
170.315(b)(2) CIR			
4. Reconcile CCDA Problems	Likert Scale	4.82	0.6
5. Reconcile CCDA Adverse Reactions	Likert Scale	4.45	0.93
6. Reconcile CCDA Medications	Likert Scale	4.82	0.6
7. Preview new CCDA with reconciled data	Likert Scale	4.64	1.21