

EHR Usability Test Report of iMed EMR 5.1

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

iMedEMR 5.1

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Table of Contents

- 1 EXECUTIVE SUMMARY**
- 2 INTRODUCTION**
- 3 METHOD**
 - 3.1 PARTICIPANTS
 - 3.2 STUDY DESIGN
 - 3.3 TASKS
 - 3.4 PROCEDURE
 - 3.5 TEST LOCATION
 - 3.6 TEST ENVIRONMENT
 - 3.7 TEST FORMS AND TOOLS

 - 3.8 PARTICIPANT INSTRUCTIONS
 - 3.9 USABILITY METRICS
- 4 RESULTS**
 - 4.1 DATA ANALYSIS AND REPORTING
 - 4.2 DISCUSSION OF THE FINDINGS
- 5 APPENDICES**
 - 5.1 Appendix 1: RECRUITING SCREENER
 - 5.2 Appendix 2: PARTICIPANT DEMOGRAPHICS
 - 5.3 Appendix 3: NON-DISCLOSURE AGREEMENT AND INFORMED CONSENT
 - 5.4 Appendix 4: EXAMPLE MODERATOR'S GUIDE
 - 5.5 Appendix 5: SYSTEM USABILITY SCALE QUESTIONNAIRE
 - 5.6 APPENDIX 6: RISK RATING

EXECUTIVE SUMMARY

A usability test of iMed EMR 5.1 was conducted on 11/7/2018 and 12/18/2018 in clinic settings by iMed Software. The purpose of this test was to test and validate the usability of the current user interface, and provide evidence of usability in the EHR Under Test (EHRUT). During the usability test, 10 healthcare providers [and/or other intended users] matching the target demographic criteria served as participants and used the EHRUT in simulated, but representative tasks.

This study collected performance data on 7 tasks typically conducted on an EHR:

- Computerized provider order entry (CPOE) – laboratory
- Computerized provider order entry (CPOE) – diagnostic imaging
- Demographics
- Problem list
- Clinical decision support (CDS)
- Implantable device list
- Clinical information reconciliation and incorporation

During the 30 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 the EHR. The administrator introduced the test, and instructed participants to complete a series of tasks (given one at a time) using the EHRUT. During the testing, the administrator timed the test and, along with the data logger(s) recorded user performance data on paper and electronically. The administrator did not give the participant assistance in how to complete the task.

Participant screens, headshots and audio were recorded for subsequent analysis.

The following types of data were collected for each participant:

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

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

Task	Partic ipant s	Task Succes s	Path Deviation	Task Time (sec)	Errors	Task Ratings (1=Easy)
	#	Total	Deviations (Observed / Optimal)	Mean	(Observed/ Completed Task)	Mean
1. Order Lab	10	10	37/30	173.8	0	1.8
1.1 Record Lab order via CPOE	10	10	15/10	76.4	0	1.8
1.2 Change Lab order via CPOE	10		12/10	70.4	0	1.8
1.3 Display changed CPOE Lab order	10		10/10	0	0	1.8
2. Order X-ray	10	10	30/30	99.1	0	1.6
2.1 Record Imaging order via CPOE	10	10	10/10	40.7	0	1.6
2.2 Change Imaging order via CPOE	10	10	10/10	54.8	0	1.6
2.3 Display changed CPOE Imaging order	10	10	10/10	0	0	1.6
3. Demographics	10	7	34/30	152.9	30%	1.3
3.1 Record a patient's Demographics	10	10	11/10	79.9	0	1.3
3.2 Change the patient's Demographics	10	7	13/10	56.4	30%	1.3
3.3 Display the patient's changed Demographics	10	10	10/10	0	0	1.3
4. Problem List	10	9	42/40	42.6	10%	1.4
4.1 Record a problem to the problem list	10	10	10/10	19.6	0	1.4
4.2 Change a problem on the problem list	10	9	11/10	23.3	10%	1.4
4.3 Display the active problem list	10	10	10/10	0	0	1.4
4.4 Display the historical problem list	10	9	11/10	4.8	10%	1.4

5. CDS	10	10	40/40	100.5	0	1.8
5.1 Add Interventions (Problem list, Medication List, Medication Allergy List, At least one Demographics, Laboratory Test, Vital Signs, and a combination of at least 2 of the elements listed above.)	10	10	10/10	45.8	0	1.8
5.2 Trigger Intervention via CCDA	10	10	11/10	60.5	0	1.8
5.2 Trigger Intervention using application data	10	10	10/10	27.5	0	1.8
5.3 Infobutton	10	10	10/10	8.5	0	1.8
5.4 Access Attributes of CDS	10	10	10/10	4.5	0	1.8
6. Implantable Device	10	10	31/30	40.4	0	1.6
6.1 Record UDI	10	10	10/10	23.3	0	1.6
6.2 Change UDI Status	10	10	11/10	10.7	0	1.6
6.3 Access UDI, device description, identifiers, and attributes	10	10	10/10	0	0	1.6
7. Reconciliation	10	9	24/20	98.7	10%	2.3
7.1 Incorporate a CCDA and conduct reconciliation	10	10	11/10	60.5	0	2.3
7.2 Generate a new CCDA with reconciled data	10	9	13/10	22	10%	2.3

The results from the System Usability Scale scored the subjective satisfaction with the system based on performance with these tasks to be: 87.6

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

- Major findings

o The usability study showed no major findings. Overall, the participants were able to complete the tasks in a satisfactory time and verbalized their happiness with the system.

- Areas for improvement

o The study showed us there was some room for improvement. The demographics screen in particular could use improvements to the user interface. The demographics fields could be tab-navigable

and the changing of race/ethnicity could possibly ask the user if they would like to remove the previous race/ethnicity.

INTRODUCTION

The EHRUT tested for this study was iMed EMR 5.1. Designed to present medical information to healthcare providers in ambulatory settings, the EHRUT consists of various modules that aim to achieve a paperless clinic environment . The usability testing attempted to represent realistic exercises and conditions.

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

METHOD

PARTICIPANTS

A total of 10 participants were tested on the EHRUT(s). Participants in the test were physicians, nurses, and administrative staff. Participants were recruited by iMed Software Corporation and were compensated [insert dollar amount or other incentive (optional)] for their time. In addition, participants had no direct connection to the development of or organization producing the EHRUT(s). Participants were not from the testing or supplier organization. Participants were given the opportunity to have the same orientation and level of training as the actual end users would have received.

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

Recruited participants had a mix of backgrounds and demographic characteristics conforming to the recruitment screener. The following is a table of participants by characteristics, including demographics, professional experience, computing experience and user needs for assistive technology. Participant names were replaced with Participant IDs so that an individual's data cannot be tied back to individual identities.

	Part ID	Gender	Age	Education	Occupation/Role	Professional Experience	Computer Experience	Product Experience	Assistive Tech. Needs
1	1	F	47	BS	RN	6yrs	limited	experienced	N/A
2	2	F	39	BS	Revenue cycle mang	1yr	proficient	experienced	N/A

3	3	F	50	BS	RN	24yrs	average	none	N/A
4	4	F	40	BS	RN	16yrs	proficient	experien ced	N/A
5	5	M	33	MD	MD	3.5 yrs	proficient	experien ced	N/A
6	6	F	48	BS	Med Assistant	27 yrs	average	experien ced	N/A
7	7	F	44	HS+some college	Medical Coding	15 yrs	proficient	experien ced	N/A
8	8	F	35	HS	Medical Assistant	14 yrs	proficient	experien ced	N/A
9	9	F	63	HS	X-Ray Tech	24 yrs	Below average	experien ced	N/A
10	10	F	34	MD	MD	4 yrs	proficient	experien ced	N/A

Table 1. Participant Characteristics

10 participants (matching the demographics in the section on Participants) were recruited and 10 participated in the usability test. 0 participants failed to show for the study.

Participants were scheduled for 30 minute sessions with 15 minutes in between 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 as provided by the recruiting firm.

STUDY DESIGN

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

During the usability test, participants interacted with 1 EHR. Each participant used the system in the same location, and was provided with the same instructions. The system was evaluated for effectiveness, efficiency and satisfaction as defined by measures collected and analyzed for each participant:

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

- Number and types of errors
- Path deviations
- Participant's verbalizations (comments)
- Participant's satisfaction ratings of the system

Additional information about the various measures can be found in Section 3.9 on Usability Metrics.

TASKS

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

1. Create and edit a lab order for a patient
2. Create and edit a radiology order for a patient
3. Reconcile patient information from an incoming CCDA
4. Utilize clinical decision support during a patient encounter
 - a. CDS add intervention and/or reference resource for each of the required elements: Problem list, Medication List, Medication Allergy List, At least one Demographics, Laboratory Test, Vital Signs, and a combination of at least 2 of the elements listed above.
 - b. Trigger the CDS intervention/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
 - c. Trigger the CDS intervention/resources added using the application data elements from each of the required elements.
 - d. View CDS intervention/resource information using the infobutton standard for data elements in the problem list, medication list, and demographics
 - e. Access the following attributes for one of the triggered CDS interventions/resources: bibliographic citation, developer, funding source, release/revision date
5. Add and edit a problem list item
6. Add and edit demographic data
7. Add and edit an implantable device

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

PROCEDURES

Upon arrival, participants were greeted; their identity was verified and matched with a name on the participant schedule. Participants were then assigned a participant ID. Each participant reviewed and signed an informed consent and release form (See Appendix 3). A representative from the test team witnessed the participant's signature.

To ensure the test ran smoothly, two iMed Software staff members participated in this test, the usability administrator and the data logger. The administrator moderated the session including administering instructions and tasks. The administrator also monitored task times, obtained post-task rating data, and

took notes on participant comments. A second person served as the data logger and took notes on task success, path deviations, number and type of errors, and comments.

Participants were instructed to perform the task (see specific instruction below):

- As quickly as possible making as few errors and deviations as possible.
- Without assistance; administrators were allowed to give immaterial guidance and clarification on tasks, but not instructions on use.
- Without using a think aloud technique.

For each task, the participants were given a copy of the task. Task timing began once the administrator finished reading the question. The task time was stopped once the participant indicated they had successfully completed the task. Scoring is discussed below in Section 3.9.

Following the session, the administrator gave the participant the post-test questionnaire (e.g., the System Usability Scale, see Appendix 5), and thanked each individual for their participation.

Participants' demographic information, task success rate, time on task, errors, deviation, verbal responses, and post-test questionnaire were recorded into a spreadsheet.

TEST LOCATION

The test facility included a quiet testing room with a table, computer for the participant, and recording computer for the administrator. Only the administrator and logger were with the participant in the test room. To ensure that the environment was comfortable for users, noise levels were kept to a minimum with ambient temperature within a normal range.

TEST ENVIRONMENT

The EHRUT would typically be used in a healthcare office or facility. In this instance, the testing was conducted in the healthcare offices themselves. For testing, the computer used PC running Windows 8. The participants used a mouse and keyboard when interacting with the EHRUT.

iMed EMR used a 19.5 inch monitor with 1024x764 resolution. The application was set up by iMed Software according to the typical system set-up and preparation. The application itself was running on a PC using a test database on a LAN connection. Technically, the system performance (i.e. response time) was representative to what actual users would experience in a field implementation. Additionally, participants were instructed not to change any of the default system settings (such as control of font size).

TEST FORMS AND TOOLS

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

1. Informed Consent
2. Moderator's Guide
3. Post-test Questionnaire

Examples of these documents can be found in Appendices 3-5 respectively. The Moderator's Guide was devised so as to be able to capture required data.

The participant's interaction with the EHRUT was captured and recorded digitally with screen capture software running on the test machine. A webcam recorded each participant's facial expressions synced with the screen capture, and verbal comments were recorded with a microphone.

PARTICIPANT INSTRUCTIONS

The administrator reads the following instructions aloud to each participant (also see the full moderator's guide in appendix B4):

Thank you for participating in this study. Your input is very important. Our session today will last about 45 minutes. During that time you will use an instance of an electronic health record. I will ask you to complete a few tasks using this system and answer some questions. You should complete the tasks as quickly as possible making as few errors as possible. Please try to complete the tasks on your own following the instructions very closely. Please note that we are not testing you, we are testing the system, therefore if you have difficulty all this means is that something needs to be improved in the system. I am here in case you need specific help, but I am not able to instruct you or provide help in how to use the application.

Overall, we are interested in how easy (or how difficult) this system is to use, what in it would be useful to you, and how we could improve it. I did not have any involvement in its creation, so please be honest with your opinions. All of the information that you provide will be kept confidential and your name will not be associated with your comments at any time. Should you feel it necessary you are able to withdraw at any time during the testing.

Following the procedural instructions, participants were shown the EHR and as their first task, were given 5 minutes to explore the system and make comments. Once this task was complete, the administrator gave the following instructions:

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

Participants were then given 4 tasks to complete. Tasks are listed in the moderator's guide in Appendix B4.

USABILITY METRICS

According to the NIST Guide to the Processes Approach for Improving the Usability of Electronic Health REcords, EHRs should support a process that provides a high level of usability for all users. The goal is for users to interact with the system effectively, efficiently, and with an acceptable level of satisfaction. To this end, metrics for effectiveness, efficiency, and user satisfaction were captured during the usability testing. The goals of the test were to assess:

1. Effectiveness of iMed EMR by measuring participant success rates and errors.
2. Efficiency of iMed EMR by measuring the average task time and path deviations.
3. Satisfaction with iMed EMR by measuring ease of use ratings.

DATA SCORING

The following table (Table 2) details how tasks were scored, errors evaluated, and the time data analyzed.

Measures	Rationale and Scoring
<p>Effectiveness:</p> <p>Task Success</p>	<p>A task was counted as a “Success” if the participant was able to achieve the correct outcome, without assistance, within the time allotted on a per task basis.</p> <p>The total number of successes were calculated for each task and then divided by the total number of times that task was attempted. The results are provided as a percentage.</p> <p>Task times were recorded for successes. Observed task times divided by optimal time for each task is a measure of optimal efficiency.</p> <p>Optimal task performance time, as benchmarked by expert performance under realistic conditions, is recorded when constructing tasks. Target task times used for task times in the Moderator’s Guide must be operationally defined by taking multiple measures of optimal performance and multiplying by a factor of 1.25 that allows some time bufferer because the participants are presumably not trained to expert performance. Thus, if expert, optimal performance on a task was 60 seconds then allotted task time performance was 75 seconds. This ratio should be aggregated across tasks and reported with mean and variance scores.</p>
<p>Effectiveness:</p> <p>Task Failures</p>	<p>If the participant abandoned the task, did not reach the correct answer or performed it incorrectly, or reached the end of the allotted time before successful completion, the task was counted as an “Failures.” No task times were taken for errors.</p> <p>The total number of errors was calculated for each task and then divided by the total number of times that task was attempted. Not all deviations would be counted as errors. This should also be expressed as the mean number of failed tasks per participant.</p> <p>On a qualitative level, an enumeration of errors and error types should be collected.</p>
<p>Efficiency:</p> <p>Task Deviations</p>	<p>The participant’s path (i.e., steps) through the application was recorded. Deviations occur if the participant, for example, went to a wrong screen, clicked on an incorrect menu item, followed an incorrect link, or interacted incorrectly with an on-screen control. This path was compared to the optimal path. The number of steps in the observed path is divided by the number of optimal steps to provide a ratio of path deviation.</p>
<p>Efficiency:</p> <p>Task Time</p>	<p>Each task was timed from when the administrator said “Begin” until the participant said “Done.” If he or she failed to say “Done,” the time was stopped when the participant stopped performing the task. Only task times for tasks that were successfully completed were included in the average task time analysis. Average time per task was calculated for each task. Variance measures (standard deviation and standard error) were also calculated.</p>
<p>Satisfaction:</p>	<p>Participant’s subjective impression of the ease of use of the application was</p>

Task Rating	<p>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 points are averaged across participants.</p> <p>Common convention is that above average ratings for systems judged easy to use should be 3.3 or above.</p> <p>To measure participants’ confidence in and likeability of iMed EMR 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 they system was easy to use,” and “I would imagine that most people would learn to use this system very quickly” See full System Usability Scale questionnaire in Appendix 5.</p>
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Table 2. Details of how observed data were scored.

RESULTS

DATA ANALYSIS AND REPORTING

The results of the usability test were calculated according to the methods specified in the Usability Metrics section above. Participants who failed to follow session and task instructions had their data excluded from the analyses.

The usability testing results for the EHRUT are detailed below (see Table 3). The results should be seen in light of the objectives and goals outlined in Section 3.2 Study Design. The data should yield actionable results that, if corrected, yield material, positive impact on user performance.

Task	Participants	Task Successes	Path Deviation	Task Time (sec)	Errors	Task Ratings (1=Easy)
	#	Total	Deviations (Observed / Optimal)	Mean	(Observed/ Completed Task)	Mean
1. Order Lab	10	10	37/30	173.8	0	1.8
1.1 Record Lab order via CPOE	10	10	15/10	76.4	0	1.8
1.2 Change Lab order via CPOE	10		12/10	70.4	0	1.8
1.3 Display changed CPOE Lab order	10		10/10	0	0	1.8

2. Order X-ray	10	10	30/30	99.1	0	1.6
2.1 Record Imaging order via CPOE	10	10	10/10	40.7	0	1.6
2.2 Change Imaging order via CPOE	10	10	10/10	54.8	0	1.6
2.3 Display changed CPOE Imaging order	10	10	10/10	0	0	1.6
3. Demographics	10	7	34/30	152.9	30%	1.3
3.1 Record a patient's Demographics	10	10	11/10	79.9	0	1.3
3.2 Change the patient's Demographics	10	7	13/10	56.4	30%	1.3
3.3 Display the patient's changed Demographics	10	10	10/10	0	0	1.3
4. Problem List	10	9	42/40	42.6	10%	1.4
4.1 Record a problem to the problem list	10	10	10/10	19.6	0	1.4
4.2 Change a problem on the problem list	10	9	11/10	23.3	10%	1.4
4.3 Display the active problem list	10	10	10/10	0	0	1.4
4.4 Display the historical problem list	10	9	11/10	4.8	10%	1.4
5. CDS	10	10	40/40	100.5	0	1.8
5.1 Add Interventions <small>(Problem list, Medication List, Medication Allergy List. At least one Demographics, Laboratory Test, Vital Signs, and a combination of at least 2 of the elements listed above.)</small>	10	10	10/10	45.8	0	1.8
5.2 Trigger Intervention via CCDA	10	10	11/10	60.5	0	1.8
5.2 Trigger Intervention using application data	10	10	10/10	27.5	0	1.8
5.3 Infobutton	10	10	10/10	8.5	0	1.8
5.4 Access Attributes of CDS	10	10	10/10	4.5	0	1.8
6. Implantable Device	10	10	31/30	40.4	0	1.6
6.1 Record UDI	10	10	10/10	23.3	0	1.6
6.2 Change UDI	10	10	11/10	10.7	0	1.6

Status						
6.3 Access UDI, device description, identifiers, and attributes	10	10	10/10	0	0	1.6
7. Reconciliation	10	9	24/20	98.7	10%	2.3
7.1 Incorporate a CCDAs and conduct reconciliation	10	10	11/10	60.5	0	2.3
7.2 Generate a new CCDAs with reconciled data	10	9	13/10	22	10%	2.3

Table 3. Details of Usability Testing Results

The results from the SUS (System Usability Scale) scored the subjective satisfaction with the system based on performance with these tasks to be: 87.6. Broadly interpreted, scores under 60 represent systems with poor usability; scores over 80 would be considered above average.

EFFECTIVENESS

All 7 tasks were as effective as we would like to see. The demographics task was the only task with an error percentage greater than 10%. The demographics user interface will be improved to further lower the number of errors.

EFFICIENCY

Participants in this study rarely deviated from the optimal path.

SATISFACTION

The System Usability Scale resulted in a score of 87.6. This score is above average.

MAJOR FINDINGS

The usability study showed no major findings. Overall, the participants were able to complete the tasks in a satisfactory time and verbalized their happiness with the system.

AREAS FOR IMPROVEMENTS

The study showed us there was some room for improvement. The demographics screen in particular could use improvements to the user interface. The demographics fields could be tab-navigable and the changing of race/ethnicity could possibly ask the user if they would like to remove the previous race/ethnicity.

APPENDICES

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

1. Sample Recruiting screener
2. Participant demographics
3. Non-Disclosure Agreement (NDA) and Informed Consent Form
4. Example Moderator's Guide
5. System Usability Scale Questionnaire

Appendix 1: RECRUITING SCREENER

Recruiting Script

Hello, my name is _____, calling from iMed Software. We are recruiting individuals to participate in a usability study for an electronic health record. We would like to ask you a few questions to see if you qualify and if you would like to participate. This should only take a few minutes of your time. This is strictly for research purposes. Can I ask you a few questions?

1. [if not obvious] Are you a male or female?
2. Have you participated in a focus group or usability test in the past 6 months? [If yes, Terminate]
3. Do you, or does anyone in your home, work in market research, usability research, web design, or software development? [If yes, Terminate]
4. Do you, or does anyone in your home, have a commercial or research interest in an electronic health record software or consulting company? [If yes, Terminate]
5. Which of the following best describes your age? [23 to 39, 40 to 59, 60 to 74, 75 and older]
6. Which of the following best describes your race or ethnic group? [Caucasian, Asian, Black/African American, Latino or Hispanic, Pacific Islander?]
7. Do you require any assistive technologies to use a computer? [if so, please describe]

Professional Demographics

1. What is your current position and title?
 - RN: Specialty: _____
 - Physician: Specialty: _____
 - Resident: Specialty: _____
 - Administrative Staff
 - Other [Terminate]
2. How long have you held this position?
3. Describe your work location and environment?
4. Which of the following describes your highest level of education? [high school graduate, GED, some college, college graduate (RN, BSN), postgraduate (MD, PhD), other (explain)]

Computer Expertise

1. Besides reading email, what professional activities do you do on the computer? [access EHR, research, reading news, shopping/banking, digital pictures, scanning documents, programming, word processing] [If no computer use at all, Terminate]
2. About how many hours per week do you spend on the computer including work and personal time? [0 to 10, 11 to 20, 20+ hours per week] [Recruit users with 20+ hours]
3. What computer platform do you usually use? [Mac, Windows, Linux, etc]
4. What internet browser(s) do you usually use? [Firefox, IE, Chrome, Safari, etc]
5. In the last month, how often have you used an electronic health record?
6. How many years have you used an electronic health record?
7. How many EHRs do you use or are you familiar with?
8. How does your work environment use patient records? [Recruit users with some electronic or all electronic]
 - on paper
 - some paper, some electronic
 - all electronic

Contact Information [If the person matches your qualifications ask]

Those are all the questions I have for you. Your background matches the people we're looking for. Would

you be able to participate on November 7th, 2018?

May I get your contact information?

- Name of participant:
- Address:
- City, state, zip:
- Daytime phone number:
- Evening phone number:
- Cell phone number:
- Email address:

Before your session starts, we will ask you to sign a release form allowing us to videotape your session. The videotape will only be used internally for further study if needed. Will you consent to be videotaped?

This study will take place at the iMed Headquarters in Lafayette, LA. I will confirm your appointment a couple of days before your session and provide you with directions to the testing location. What time is the best time to reach you?

Appendix 2: PARTICIPANT DEMOGRAPHICS

Following is a high-level overview of the participants in this study.

Gender

Men	[1]
Women	[9]
Total (participants)	[10]

Education

RN/BS	[5]
HS	[3]
MD	[2]
Total (participants)	[10]

Non-Disclosure Agreement

THIS AGREEMENT is entered into as of _____, 2018 between _____ (“the Participant”) and iMed Software Corporation located at 221 Southpark Road B1, Lafayette, LA 70508.

The Participant acknowledges his or her voluntary participation in today’s usability study bay bring the Participant into possession of Confidential Information. The term “Confidential Information” means all technical and commercial information of a proprietary or confidential nature which is disclosed by iMed Software Corporation, or otherwise acquired by the Participant, in the course of today’s study.

By way of illustration, but not limitation, Confidential Information includes trade secrets, processes, formulae, data, know-how, products, designs, drawings, computer aided design files, and other computer files, computer software, ideas, improvements, inventions, training methods and materials, marketing techniques, plans, strategies, budgets, financial information, or forecasts.

Any information the Participant acquires relating to this product during this study is confidential and proprietary to iMed Software Corporation and is being disclosed solely for this purposes of the Participant’s participation in today’s usability study. By signing this form the Participant acknowledges that s/he will receive monetary compensation for feedback and will not disclose this confidential information obtained today to anyone else or any other organizations.

Participant’s printed name: _____

Signature: _____ Date: _____

Informed Consent

iMed Software Corporation would like to thank you for participating in this study. The purpose of this study is to evaluate an electronic health records system. If you decide to participate, you will be asked to perform several tasks using the prototype and give your feedback. The study will last about 30 minutes.

Agreement

I understand and agree that as a voluntary participant in the present study conducted by iMed Software Corporation I am free to withdraw consent or discontinue participation at any time. I understand and agree to participate in the study conducted and videotaped by iMed Software Corporation.

I understand and consent to the use and release of the videotape by iMed Software Corporation. I understand that the information and videotape is for research purposes only and that my name and image will not be used for any purpose other than research. I relinquish any rights to the videotape and understand the videotape may be copied and used by iMed Software Corporation without further permission.

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

I understand and agree that the data collected from this study may be shared with outside of iMed Software Corporation iMed Software Corporation's certification testing lab. I understand and agree that data confidentiality is assured, because only de identified data - i.e., identification numbers not names - will be used in analysis and reporting of the results.

I agree to immediately raise any concerns or areas of discomfort with the study administrator. I understand that I can leave at any time.

Please check one of the following:

- YES, I have read the above statement and agree to be a participant.
- NO, I choose not to participate in this study.

Signature: _____ Date: _____

iMed EMR Usability Test Moderator's Guide

Administrator: _____

Data Logger: _____

Date: _____ Time: _____

Participant #: _____

Location: _____

Prior to testing:

- Confirm schedule with Participants
- Ensure EHRUT lab environment is running properly
- Ensure lab and data recording equipment is running properly

Prior to each participant:

- Reset application
- Start session recording with Silverback

Prior to each task:

- Reset application to starting point for next task

After each participant:

- End session recordings with Silverback

After all testing:

- Back up all video and data files

Orientation (5 minutes)

Thank you for participating in this study. Your input is very important. Our session today will last about 30 minutes. During that time you will take a look at an electronic health record system.

I will ask you to complete a few tasks using this system and answer some questions. We are interested in how easy (or how difficult) this system is to use, what in it would be useful to you, and how we could improve it. You will be asked to complete these tasks on your own trying to do them as quickly as possible with the fewest possible errors or deviations. Do not do anything more than asked. If you get lost or have difficulty I cannot answer or help you with anything to do with the system itself. Please save your detailed comments until the end of a task or the end of the session as a whole when we can discuss freely.

I did not have any involvement in it's creation, so please be honest with your opinions.

The product you will be using today is iMed EMR 5.1 alpha version. Some of the data may not make sense as it is placeholder data.

We are recording the audio and screenshots of our sessions today. All of the information that you provide will be kept confidential and your name will not be associated with your comments at any time.

Do you have any questions or concerns?

Preliminary Questions (5 minutes)

What is your age?

What is your sex?

What is your highest level of education completed?

What is your job title / appointment?

How long have you been working in this role?

What are some of your main responsibilities?

How would you describe your computer experience?

Tell me about your experience with electronic health records and iMedEMR specifically?

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

Task 1: First Impressions (30 seconds)

This is the application you will be working with. Have you heard of it? ____ Yes ____ No
If so, tell me what you know about it.

Notes/Comments:

[Show participant the EHRUT]

Please do not click on anything just yet. What do you notice? What are you able to do here?
Please be specific.

Notes/Comments:

Task 1: Computerized Provider Order Entry Screen for Labs (3 minutes)

Take the participant to the starting point for the task [open Test Patient encounter, scroll to plan area]

After examining Test Patient, you have decided to order a Complete Blood Count (85025) to be done in office. Place an order for this test and display the order.

[wait for participant to create the order]

After placing the order for the CBC, you realize it was the incorrect lab to order. Cancel the CBC order and create one for a CMP (80053-1). Place the order for this test and then display the order.

Success:

- Easily completed
- Completed with difficult or help (describe below).
- Not completed.

Comments:

Task Time: _____ Seconds [Goal: 90 seconds / Expert time: 72 seconds]

Optimal Path: Encounter Screen → Order Screen → Click on “Search for Labs” → type in “CBC” → Select “CBC” → Click “Add” Button → Click “Save & Close” button

- Correct
- Minor Deviations / Cycles (describe below)
- Major Deviations (describe below)

Comments:

Observed Errors and Verbalizations:

Comments:

Rating:

Overall, this task was: _____

1	2	3	4	5
Very Easy	Somewhat Easy	Neither Easy nor Difficult	Somewhat Difficult	Very Difficult

Administrator / Notetaker Comments

Task 2: Computerized Provider Order Entry Screen for Imaging (3 minutes)

Take the participant to the starting point for the task [open Test Patient encounter, scroll to plan.]

After examining Test Patient, you have decided to order a Chest X-ray (71275). Place an order for this test.

[wait for participant to create the order]

After placing the order for the Chest X-ray, you realize it was the incorrect test to order. Delete the Chest X-ray order and create one for a Chest CT Scan (71260). Place the order for this test and then display the order.

Success:

- Easily completed
- Completed with difficult or help (describe below).
- Not completed.

Comments:

Task Time: ____ Seconds [Goal: 90 Seconds / Expert time: 72 seconds]

Optimal Path: Encounter Screen → Order Screen → Click on “Search for Labs” → type in “Chest X-ray” → Select “Chest X-ray” → Click “Add” Button → Click “Save & Close” button

- Correct
- Minor Deviations / Cycles (describe below)
- Major Deviations (describe below)

Comments:

Observed Errors and Verbalizations:

Comments:

Rating:

Overall, this task was: _____

1	2	3	4	5
Very Easy	Somewhat Easy	Neither Easy nor Difficult	Somewhat Difficult	Very Difficult

Administrator / Notetaker Comments:

Task 4: Demographics (5 minutes)

Take the participant to the starting point for the task [open Test Patient chart.]

Record Test Patient’s preferred language as “English”, their date of birth as January 1st, 1960, their birth sex as male, race as caucasian, ethnicity as non-hispanic, sexual orientation as heterosexual, and gender identity as male.

[after participant saves demographics]

Now change the patient’s preferred language to “Spanish”, their date of birth as January 1st, 1970, their birth sex as female, race as American Indian, ethnicity as hispanic, sexual orientation as homosexual, and gender identity as female.

Success:

- Easily completed
- Completed with difficult or help (describe below).
- Not completed.

Comments:

Task Time: ____ Seconds [Goal: 200 Seconds / Expert time: 100 seconds]

Optimal Path: Patient Chart → Edit Demographics → type in language → type in date of birth → type in birth sex → type in race → type in ethnicity → type in sexual orientation → type in gender identity → save edits

- Correct
- Minor Deviations / Cycles (describe below)
- Major Deviations (describe below)

Comments:

Observed Errors and Verbalizations:

Comments:

Rating:

Overall, this task was: _____

1	2	3	4	5
Very Easy	Somewhat Easy	Neither Easy nor Difficult	Somewhat Difficult	Very Difficult

Administrator / Notetaker Comments:

Task 5: Problem List (3 minutes)

Take the participant to the starting point for the task [open Test Patient chart.]

Record Test Patient's problem of Diabetes and save.

[after participant saves problem]

Now change the problem from Diabetes to Hypertension.

[after participant saves problem]

Now please display the active problem list.

[after participant shows list]

Now please display the historical problem list.

Success:

- Easily completed
- Completed with difficult or help (describe below).
- Not completed.

Comments:

Task Time: ____ Seconds [Goal: 21 Seconds / Expert time: 16.4 seconds]

Optimal Path: Patient Chart → Edit Problems → type in problem → select problem → Save

- Correct
- Minor Deviations / Cycles (describe below)
- Major Deviations (describe below)

Comments:

Observed Errors and Verbalizations:

Comments:

Rating:

Overall, this task was: _____

1	2	3	4	5
Very Easy	Somewhat Easy	Neither Easy nor Difficult	Somewhat Difficult	Very Difficult

Administrator / Notetaker Comments:

Task 4: Clinical Decision Support (10 minutes)

Take the participant to the starting point for the task [Take user to systems > Conditions under the system admin user.]

- Activate a CDS intervention for each of these 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 listed above

[Take user to pt chart and add the CCDA with warfarin, then bring them to the reconcile screen]

- Incorporate patient information from a transition of care/referral summary

[Log user into Dr account and open the encounter screen for the test patient.]

- Add Diabetes Mellitus into the patient's assessments and click on the check mark of the new CDS intervention for Diabetes
- Access the following attributes for one of the triggered CDS interventions: bibliographic citation, developer, funding source, release/revision date
- View the resource information using the Infobutton "i" for data elements in the problem list, medication list, and demographics

Success:

- Easily completed
- Completed with difficult or help (describe below).
- Not completed.

Comments:

Task Time: ____ Seconds [Goal: 21 Seconds / Expert time: 16.4 seconds]

Optimal Path: Encounter Screen → Exam section → type in height → type in weight → Click "Adult BMI" Button

- Correct
- Minor Deviations / Cycles (describe below)
- Major Deviations (describe below)

Comments:

Observed Errors and Verbalizations:

Comments:

Rating:

Overall, this task was: _____

1	2	3	4	5
Very Easy	Somewhat Easy	Neither Easy nor Difficult	Somewhat Difficult	Very Difficult

Administrator / Notetaker Comments:

Task 5: Reconciliation(3 minutes)

Take the participant to the starting point for the task [from main dashboard open reconciliation for Test Patient.]

Test Patient has come to your clinic from Dr. Seven. Reconcile Test Patient’s list of medications, allergies, and problems between what your clinic already has and what Dr. Seven has sent then generate a new Clinical Summary for this patient.

Success:

- Easily completed
- Completed with difficult or help (describe below).
- Not completed.

Comments:

Task Time: ____ Seconds [Goal: 21 Seconds / Expert time: 16.5 seconds]

Optimal Path: Reconciliation Screen → Select current Problem list from drop down → Select CCDA from outside Physician in drop down → click “next” → Click “Commit Changes” Button

- Correct
- Minor Deviations / Cycles (describe below)
- Major Deviations (describe below)

Comments:

Observed Errors and Verbalizations:

Comments:

Rating:

Overall, this task was: _____

1	2	3	4	5
Very Easy	Somewhat Easy	Neither Easy nor Difficult	Somewhat Difficult	Very Difficult

Administrator / Notetaker Comments:

Task 6: Implantable Device(3 minutes)

Take the participant to the starting point for the task [Open Test Patient chart.]

Test Patient has an implantable device with the Unique ID:
=/08717648200274=,000025=A99971312345600=>014032=}013032&,1000000000000XYZ121
that was implanted on 01/01/2018 and it currently active. Add this implantable device to the
patient's chart.

[after participant saves implantable device]

Now change the device to "inactive" status. And display the modified details of the device on the
screen.

Success:

- Easily completed
- Completed with difficult or help (describe below).
- Not completed.

Comments:

Task Time: ____ Seconds [Goal: 21 Seconds / Expert time: 16.5 seconds]

Optimal Path: Patient Chart → Add implantable device → Enter details → click "Save & Close"

- Correct
- Minor Deviations / Cycles (describe below)
- Major Deviations (describe below)

Comments:

Observed Errors and Verbalizations:

Comments:

Rating:

Overall, this task was: _____

1	2	3	4	5
Very Easy	Somewhat Easy	Neither Easy nor Difficult	Somewhat Difficult	Very Difficult

Administrator / Notetaker Comments:

Final Questions (5 minutes)

What was your overall impression of this system?

What aspects of the system did you like most?

What aspects of the system did you like least?

Were there any features that you were surprised to see?

What features did you expect to encounter but did not see? That is, is there anything that is missing from this application?

Compare this system to other systems you have used.

Would you recommend this system to your colleagues?

[Administer the System Usability Scale Questionnaire]

Strongly
disagree

Strongly
agree

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

1	2	3	4	5
---	---	---	---	---

2. I found the system unnecessarily complex.

1	2	3	4	5
---	---	---	---	---

3. I thought the system was easy to use.

1	2	3	4	5
---	---	---	---	---

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

1	2	3	4	5
---	---	---	---	---

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

1	2	3	4	5
---	---	---	---	---

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

1	2	3	4	5
---	---	---	---	---

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

1	2	3	4	5
---	---	---	---	---

8. I found the system very cumbersome to use.

1	2	3	4	5
---	---	---	---	---

9. I felt very confident using the system.

1	2	3	4	5
---	---	---	---	---

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

1	2	3	4	5
---	---	---	---	---

Appendix 6: RISK RATING

RISK SCALE: 1 Lowest Risk to 5 Highest Risk

CPOE - Labs

- Record Lab order via CPOE - 4
- Change Lab order via CPOE - 3
- Display changed CPOE Lab order - 1

CPOE - Diagnostic Imaging

- Record Imaging order via CPOE - 4
- Change Imaging order via CPOE - 3
- Display changed CPOE Imaging order - 1

Demographics

- 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) - 3
- 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) - 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) - 1

Problem List

- Record a problem to the problem list - 4
- Change a problem on the problem list - 3
- Display the active problem list - 1
- Display the historical problem list - 1

Clinical Decision support

- Add a CDS intervention and/or reference resource for each of the required elements
 - Problem list - 3
 - Medication list - 3
 - Medication Allergy List - 3
 - At least one Demographic - 3
 - Laboratory Test - 3
 - Vital Signs - 3
 - And a combination of at least 2 of the elements listed above - 3
- Trigger the CDS interventions/resources added using the applicable data elements from each of the required elements - 4
- View the intervention/resource information using the Infobutton standard for data elements in the problem list, medication list, and demographics - 2
- 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 - 4
- Access the following attributes for one of the triggered CDS interventions/resources: bibliographic citation, developer, funding source, release/revision date - 1

Implantable Device List

- Record UDI - 4

- Change UDI Status - 2
- Access UDI, device description, identifiers, and attributes - 1

Clinical Information Reconciliation and Incorporation

- 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 - 5
- Generate a new CCDA with reconciled data - 3