EHR Usability Test Report of Elixir Version #1

(Prepared in accordance with NISTIR 7742 Customized Common Industry Format Template for Electronic Health Record Usability Testing)

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

Elixir Version #1

Date of Usability Test: 10/10/2023

Date of Report: 10/17/2023

Report Prepared By:

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EXECUTIVE SUMMARY

A usability test of Elixir version # 1 was conducted on 10/10/2023 by via MS Teams. 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).

REFERENCES:
The EHR was developed following usability guidelines :

UCD Process	NISTIR-7741 Guide to the Processes Approach for Improving the Usability of Electronic Health Records (nistir7741.pdf).
Description	NIST guide provides guidelines for those developing electronic health record (EHR) applications who need to know more about processes of user centered design (UCD). An established UCD process ensures that designed EHRs are efficient, effective, and satisfying to the user.
Citation	Schumacher, R. and Lowry, S. (2010), (NISTIR 7741) NIST Guide to the Processes Approach for Improving the Usability of Electronic Health Records, (https://doi.org/10.6028/NIST.IR.7741)

During the usability test, 11 healthcare providers matching the target demographic criteria served as participants and used the EHRUT in simulated, but representative, tasks. This study collected performance data on 4 tasks typically conducted on an EHR:

1. Updating patient demographics [170.315 a.5]
2. Recording the Universal Device Identifier code into the patient record [170.315 a.14]
3. Creating the current medication list [170.315 a.1]
4. Creating a new clinical decision alert [170.315 a.9]

During the 15-30 minute usability test, each participant was greeted by the administrator. All 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 recorded user performance data on paper and electronically. The administrator did not give the participant assistance in how to complete the task.

A login with password and a "User Manual" consisting of step-by-step instructions and screenshots using a fictitious patient and representative data was provided to each participant, similar to the type of training material provided to any new user of the EHRUT.

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 from optimum path
- 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. Participants were not compensated for their time as testing was performed as part of the participants' workday. 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.

S No	Task	Measure	Task Success	Path Deviation		Task Time		Errors	Task Ratings
		#	Mean (SD)	Deviations (Observed)	Deviations (Optimal)	Mean (SD)	Deviations (Observed/Optimal)	Mean (SD)	Mean (SD)
1.	Updating patient Demographics	170.315 a.5	100 (0)	7	7	59 (17)	14/45	0(0)	5 (0)
2.	Recording the Universal Device Identifier code into the patient record	170.315 a.14	100 (0)	3	3	14 (5)	4/10	0(0)	5 (0)
3.	Creating the current medication list	170.315 a.1	100 (0)	20	7	33 (32)	18/15	0(0)	4.4 (0.70)
4.	Creating a new clinical decision alert	170.315 a.9	100 (0)	6	5	16 (10)	12/4	0(0)	4.8 (1.1)

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

Major findings

All participants were at least somewhat familiar with the Elixir version #1 system. In most cases, users were able to work through the tasks quickly and without

assistance. It was noted that there were some components of tasks that were confusing to the user. The administrator felt that most of the confusion lay in the fact that the participant did not perform that task in their regular workflow, as those who did performed well in the exercise.

Some users stated that they routinely zoom in their screens to more than 100% for larger fonts and easier readability.

In regard to deviations, the most difficult task was the addition of an implantable device. There was some comment about the need to enter the procedure first, as their practice would not have implanted the device and was just recording its presence. The screens were unfamiliar to all of the users and actual entry of the data into the screens required their full concentration. Otherwise, deviations were generally within expected ranges.

The administrators noted many small exclamatory comments, most not really relevant to the EHRUT, but to workflow. It was also noted that the participants often did not take time to read the task fully and sometimes were forced to backtrack to reach the required conclusion. These were deemed to be deviations – not errors, as the desired conclusion was eventually reached.

Overall, administrators felt that participant satisfaction with the program and their performance using it was adequate-to-good. The majority of deviations from the optimal path were felt to be the result of user unfamiliarity with the task itself, not from within the program. Participants verified this to us, stating that they "never did this" and "this isn't my job."

Areas for improvement

More training and cross-training would make the system more familiar to all users. This would be primarily a function of the office management using materials provided by Mirketa Inc.

Improvements could be made to the layout and usable screen size of some screens to make them less crowded as well as increasing font size for readability.

Users totally unfamiliar with certain screens showed difficulty finding the appropriate places to enter certain data elements or search for criteria, expecting to find them elsewhere on the screen. These issues could be addressed to make those screens more intuitive.

INTRODUCTION

The EHR Under Test (EHRUT) tested for this study was Elixir version #1. Designed to present medical information to healthcare providers the EHRUT is a secure web browser-based Electronic Health Record system. 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 EHRUT. To this end, measures of effectiveness, efficiency and user satisfaction such as time on task, ease of use and intuitiveness, were captured during the usability testing.

METHOD

PARTICIPANTS

A total of 11 participants were tested on the EHRUT. Participants in the test were medical providers and staff of a state of their speciality office. Participants were recruited from within the offices of current users of the EHR and were not compensated for their time. Participants had no direct connection to the development of or organization producing the EHRUT. Participants had the same orientation and level of training as the actual end users 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 the 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, 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	Organization Role	Professional Experience (Months)	Computer Experience (Months)	Product Experience (Months)	Assistive Technology Needs
1	Phys 1	F	40-49	Doctorate degree (PhD)	Physician	60	60	24	None
2	Phys 2	M	40-49	Doctorate degree (PhD)	Physician	72	72	24	None
3	Phys 3	M	40-49	Doctorate degree (PhD)	Physician	72	72	24	None
4	Phys 4	F	40-49	Doctorate degree (PhD)	Physician	60	60	24	None
5	Phys 5	F	40-49	Doctorate degree (PhD)	Physician	60	36	24	None
6	Nurse 1	F	30-39	Some college credit, no degree	Nurse	36	36	12	None
7	Nurse 2	F	40-49	Some college credit, no degree	Nurse	84	84	12	None
8	Office 1	F	40-49	High school Graduate	Office Staff	24	2	12	None
9	Office 2	F	40-49	High school Graduate	Office Staff	48	48	12	None
10	Office 3	F	40-49	High school Graduate	Office Staff	12	12	12	None
11	Phys 6	M	40-49	Doctorate degree (PhD)	Physician	60	60	24	None

i.e., 11 participants were recruited and participated in the usability test. No participants failed to show for the study. Participants were scheduled for 15-30 minute sessions with at least 10 minutes in between each session for debrief by the administrator(s) to reset systems to proper test conditions.

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 participants reported improvements that could be made to the application to address better workflow and ease of use. The data from this test may serve as a baseline for future tests with an updated version of the same EHR and/or comparison with other EHRs provided the same tasks are used. In short, this testing serves as both a means to record or benchmark current usability, but also to identify areas where improvements must be made.

During the usability test, participants interacted with one EHR. Each participant used the system in the same location 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
- Task deviations from optimal path
- Participant's verbalizations (comments)
- Participant's satisfaction ratings of the system

TASKS

A number of tasks were constructed that would be realistic and representative of the kinds of activities a user might perform with this EHR. Tasks were selected based on the ONC CEHRT 2015 certification criteria, considering frequency of use, potential for risk to patient safety, and criticality of function. The Safety-Enhanced Design tasks for the ten ONC CEHRT 2015 certification criteria included:

1. Updating patient Demographics [170.315 a.5]
2. Recording the Universal Device Identifier code into the patient record [170.315 a.14]
3. Creating the current medication list [170.315 a.1]

New Prescriptions:	Lasix 20mg	Nitroglycerin 50 mg/10 mL IV
	Cialis 20 mg	Penicillin V Potassium 500 mg tab
	Oxycodone	

4. Creating a new clinical decision alert [170.315 a.9]
   Alert for High Blood Pressure

Tasks were selected based on their frequency of use, criticality of function, and those that may be most troublesome for users.

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.

An informed consent and release form was not deemed necessary.

Mirketa Inc staff members administered this test. Because of the small size of the testing group and testing in two locations simultaneously, one administrator worked at each site administering instructions and tasks, monitoring task times, obtaining post-task rating data, and taking notes on participant comments. Additionally, each took notes on task success, path deviations, number and type of errors, and comments. The usability testing staff members were experienced with usability testing with significant background in the EHR industry and 5 or more years' experience with Elixir version #1 specifically.

Participants were instructed to perform the tasks as quickly as possible making as few errors and deviations as possible.

All participant data was de-identified and kept confidential.

For each task, the participants were given a written copy of the task. Administrators were allowed to give immaterial guidance and clarification on tasks, but not instructions on use. Participants were provided with screenshots guiding them through each task for their use, if unable to perform the task without assistance.

Task timing began once the administrator finished reading the question. The task time was stopped once the participant had successfully completed the task. After each task, the participant was directed to enter a 0-5 score for Viewing, Entering and Editing each task into their individual scorecard. Each individual was thanked for their participation.

Following the session, the administrator distributed the post-test questionnaire (e.g., the System Usability Scale) to the participants.

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

TEST LOCATION

The test facility included a quiet testing room with tables and computers for the participants. To ensure that the environment was comfortable for users, noise levels were kept to a minimum with the ambient temperature within a normal range. All of the safety instruction and evacuation procedures were valid, in place, and well-known to the participants.

TEST ENVIRONMENT

The EHRUT would be typically used in a healthcare office or facility. In this instance, the testing was conducted in online mode. For testing, the computers used were laptops running Windows 11 / Mac. The participants used a keyboard and mouse when interacting with the EHRUT.

The Elixir version #1 application was set up by the Mirketa staff. The application itself was running on a Cloud platform using a test database accessed with an internet browser. 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. Recruiting Screener: Electronic Health Record Survey
2. Participant Demographics

3. Moderator's Guide
4. System Usability Scale Questionnaire

Examples of these documents can be found in Appendices 1-4 respectively.

PARTICIPANT INSTRUCTIONS

The administrator read the following instructions aloud to each participant (also see the full moderator's guide in Appendix 3).

> "The Usability Testing is a test of OUR system, not your performance. We welcome both positive and negative feedback on your experience navigating through the tasks that follow.
>
> A specific task may or may not be included in your manual, according to your assigned role and your typical office workflow. Most of these tasks will already be familiar to you. Please complete them to the best of your ability. If you need help with a task, screenshots are provided to guide you through the process. If you use the screenshots, it is important to follow the numbered steps for each section in order to achieve the expected results. You should be aware that in many cases, problems and contraindications are meant to be generated. This is to test our system for use in real office situations.
>
> A successfully completed task will be indicated by the expected appearance of the entry in the patient record.
>
> To judge the system's ease of use, we ask you to record the time it takes to complete the tasks. When I say "BEGIN", please start your timer. When you have finished each task, please stop your timer.
>
> If you find you are totally unable to complete the task and don't wish to continue with it, say aloud "QUIT".
>
> At the end of each task, you will be asked to record your time and to score the task on a provided scorecard. Each task has 3 criteria to rank from 0-5:
> Very Easy = 5; Easy = 4; Average = 3; Slightly Difficult = 2; Very Difficult = 1; Deficient = 0
>
> Any score below 3 will trigger a return to the developer for adjustments/corrections. You will also have an opportunity to add comments about each section. These comments will be helpful to us in refining our system.

> You have been assigned a specific patient in the system. Sign on using your assigned tester User Name and Password. Choose and open the patient assigned to you. The Patient's Initial visit has already been created in the system."

Participants were then given 4 tasks to complete. Tasks are listed in the moderator's guide in Appendix 3.

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

DATA SCORING

The following 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, was defined by taking a measure of optimal performance and multiplying by 2, thus allowing a time buffer because the participants are presumably not trained to expert performance. Thus, if expert, optimal performance on a task was 100 seconds then allotted task time performance was 200 seconds. This ratio was 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 "Failure." 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. 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 observed. 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. Optimal paths were created when constructing the tasks. Because of the limited number of testing staff and participants it was determined that deviations would be observed ,noted and counted.

Efficiency: Task Time	Each task was timed from when the administrator said "Begin" until 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.
Satisfaction: Task Rating	Participant's subjective impression of the ease of use of the application was measured by administering both a simple post-task review on the scoring form 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 EHRUT overall, the testing team administered the System Usability Scale (SUS) post-test questionnaire. Questions included, "I think I would like to use this system frequently," "I thought the system was easy to use," and "I would imagine that most people would learn to use this system very quickly." See full System Usability Score questionnaire in Appendix 4.

RESULTS

DATA ANALYSIS AND REPORTING

The results of the usability test were calculated according to the methods specified in the Usability Metrics section above. No participants failed to follow session and task instructions resulting in their data excluded from the analyses.

The usability testing results for the EHRUT are detailed below.

S No	Task	Measure	Task Success	Path Deviation		Task Time		Errors	Task Ratings
		#	Mean (SD)	Deviations (Observed)	Deviations (Optimal)	Mean (SD)	Deviations (Observed/Optimal)	Mean (SD)	Mean (SD)
1.	Updating patient Demographics	170.315 a.5	100 (0)	7	7	59 (17)	14/45	0(0)	5 (0)
2.	Recording the Universal Device Identifier code into the patient record	170.315 a.14	100 (0)	3	3	14 (5)	4/10	0(0)	5 (0)
3.	Creating the current medication list	170.315 a.1	100 (0)	20	7	33 (32)	18/15	0(0)	4.4 (0.70)
4.	Creating a new clinical decision alert	170.315 a.9	100 (0)	6	5	16 (10)	12/4	0(0)	4.8 (1.1)

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

Demographics entries posed no difficulties. New features of Demographics (170.315 a.5) regarding race and gender caused some comment, mostly regarding their actual use in a clinical setting. It was generally felt that the gender requirements could be awkward in actual use and would only be recorded if the patient self-identified.

The Implantable Device entry was new to all users. It was agreed that there was a need to record the presence of the device, but potential entry of long UDI numbers was deemed to be burdensome.

The entering of current medications in Elixir version #1 utilizes the 3rd party provider, NewCrop. Using NewCrop, CPOE -Medication (170.315 a.1) was tested together in Usability Testing. Testers were familiar with the interface and there was no difficulty with the data entry. The only real comment was that the testing did not accurately reflect real Rx composing because the final result was not transmitted, only saved to Current Medications. Testers considered this to be a shortcoming of the testing design, not the EHR itself.

Clinical Decision Support (170.315 a.9) was familiar to those testing it. There was some confusion as to their generation and use in their own workflow, but not with the system itself.

EFFECTIVENESS

For the most part, participants were assigned modules to test based on their real-life work duties. This meant that the areas tested were at least somewhat familiar to them and the concepts clear.

Participants generally felt that the system was effective in capturing the necessary data and that it was easy to use and relatively intuitive.

The administrator noted there was some difficulty on some screens in finding the correct button to click to get to a selection screen. The Implantable Device entry process was confusing to participants as it had several steps and the screen looked crowded and had the addition of a new icon not seen in any other screen.

Verbal comments were mostly regarding the usefulness of a particular task in their own workflow.

Participants testing tasks with which they had no familiarity naturally had the most difficulty. There were several relatively new employees included in the 11 testers and their exposure to EHRs and Elixir version # 1 was limited. Generally, though, all the participants were able to perform the tasks easily and relatively quickly.

EFFICIENCY

The EHRUT was generally felt to be efficient in collecting all the needed data. Some participants felt that a few of the individual tasks were confusing and could be streamlined to fewer steps.

SATISFACTION

Average satisfaction scores ranged from a low of 3.67 to a high of 4.89. On the individual scorecards, most tasks were given at least a "3" overall for their ease of viewing, entering and editing. One participant gave consistently low scores across the board, with several tasks scoring a "2."

After testing, the post-test questionnaire was distributed (see Appendix 4). Each user was asked to rate their satisfaction with the EHRUT by responding to the questions with a number score from 1 (strongly disagree) to 5 (strongly agree). Eleven users returned their questionnaires. The following is an overview of the scores returned in the questionnaire.

	Number of Responses				
1= strongly disagree; 5 = strongly agree	**1**	**2**	**3**	**4**	**5**
1. I think that I would like to use this system frequently	1	2	4	4	
2. I found the system unnecessarily complex	2	3	2	4	
3. I thought the system was easy to use		6	3		2
4. I think that I would need the support of a technical person to be able to use this system	4	1	6		
5. I found the various functions in this system were well integrated	2	5	4		
6. I thought there was too much inconsistency in this system	3	2	4	2	
7. I would imagine that most people would learn to use this system very quickly		6	2	3	
8. I found the system very cumbersome to use	1	6	2	2	
9. I felt very confident using the system		4		4	3
10. I needed to learn a lot of things before I could get going with this system	2	3	3	3	

Overview of Final Questions

"What was your overall impression of this system?"

> Responses mostly ranged from fair to good, noting it to be easy/user friendly. It was stated that the system might appear complicated at first but would be easy to adapt to.

"What aspects of the system did you like most?"

The ease of patient chart interface and the ability to import and reconcile CCDAs were the two aspects commented upon.

"What aspects of the system did you like least?"

A few users felt the system could use more integration between their other Healthcare applications. It was also mentioned that some participants would prefer use of the Chrome browser over Firefox, Opera, Edge etc.

"Were there any features that you were surprised to see?"

There were no users who reported being surprised to see anything within the system.

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

At least one user felt the system was missing some functionality, but no specifics were mentioned. Another wished for the ability to graph laboratory results in the system.

"Compare this system to other systems you have used."

Most users did not respond to this question at all or entered N/A. Two of these users had not used other systems. Of those who responded, only one compared it unfavorably to another EMR

"Would you recommend this system to your colleagues?"

Recommendations were evenly divided between yes and no.

DISCUSSION OF RESULTS

MAJOR FINDINGS

All users were already familiar with the look and content of the EHRUT. Most of the participants found the interface to be easy to use and had no issues finding the screens and buttons they needed to follow the optimum path. Most difficulties/deviations arose because of individual user unfamiliarity with the specific type of task, in that they did not access those screens on a regular basis and weren't familiar with the exact placement of tabs, buttons, and fields or with specific terminology, codes, etc. Even with those difficulties, the correct path was fairly readily found and accomplished with success.

As expected, demographics and order entry tasks tested well. Although there were some changes to demographics in this version, the interface presented them in a familiar way and, other than discussion of the requirements themselves, no issues were encountered. Also testing well was the new requirement for entry of an Implantable Device. Even with the necessity of adding a Procedure first, the burden of entering the UDI number and the

addition of a new type of icon for moving to the next step, users were able to move through the process with few difficulties relatively quickly.

Those tasks involving the use of the NewCrop prescription pharmaceutical system showed few deviations but were performed slightly slower than anticipated. This may be due to the relatively low familiarity of the selected users or the NewCrop interface, itself.

Clinical Decision Support – the creation of patient "Alerts" – required more time and engendered a few more deviations, probably due to unfamiliarity with the process on the part of most users and the test requirement to type text and link information manually. This was considered to be a logical reason for the added time and deviations.

Unexpectedly, the Demographics section showed a few more deviations from the optimal path than expected. However, these items still tested well and were performed in good time.

AREAS FOR IMPROVEMENT

The EHRUT provides all of the required elements for successful patient data management.

It is felt that most needed is more training and cross-training to make the system more familiar to all users. Of course, real-time office workflow may make additional training difficult.

Improvements could be made to the layout of some screens to make them less crowded and easier to find the correct field. A few participants commented that the fonts seemed too small and difficult to read and that, in some cases, usable screen size could be enlarged to space out the entry items.

There were some cases where the users showed difficulty finding the appropriate places to enter search criteria, expecting to find them elsewhere on the screen. One screen was remarked upon as having an icon for entry to the next screen unlike any others in the system, causing some confusion.

Users suggested that updates should be made to allow the system to better interface with other systems in the clinic and add the ability to graph patient data. These capabilities are currently under development.

APPENDICES

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

1: Recruiting Screener: Electronic Health Record Survey

2: Participant Demographics

3: Moderator's Guide

4: System Usability Scale Questionnaire

Appendix 1: SAMPLE RECRUITING SCREENER

The purpose of a screener to ensure that the participants selected represent the target user population as closely as possible. (Portions of this sample screener are taken from https://www.usability.gov/how-to-and-tools/resources/templates.html and adapted for use.)
The Stage 3 Electronic Health Record edition requires your participation in a usability study.

Please fill out the following information required for the study.

Contact Information:

Name of participant: _____

Primary location: _____

Email address: _____

1. Are you male or female? Male _____ Female _____

2. Have you participated in a focus group or usability test in the past 6 months?
Yes _____ No _____

3. Do you, or does anyone in your home, work in marketing research, usability research, web design, or other computer work? Yes _____ No _____

4. Do you, or does anyone in your home, have a commercial or research interest in an electronic health record software or consulting company? Yes _____ No _____

5. Which of the following best describes your age?
23 to 39 _____ 40 to 59 _____ 60 to 74 _____
75 or older _____

6. Which of the following best describes your race or ethnic group?
Caucasian _____ Asian _____ Black/African American _____
Latino/a or Hispanic _____ Other _____

7. Do you require any assistive technologies to use a computer? Yes ____ No ___
If Yes, Please Describe: _____
_____

Professional Demographics:

8. What is your current position and title? (Must be healthcare related.)
   _____Administrative Staff
   _____Office Staff
   _____RN
   _____Physician
   _____Therapist
   _____Medical Assistant
   _____Other Medical Specialty _____

9. How long have you held this position? _____

10. Which of the following describes your highest level of education?
    High School/GED _____ Some College _____
    College Graduate (RN/BSN) _____ Postgraduate (MD/PhD) _____
    Other: Please Describe: _____

Computer Expertise:

11. Besides reading email, what professional activities do you do on the computer?
    Access EHR _____ Research _____ News _____ Shopping/Banking _____
    Digital Pictures _____ Programming _____ Microsoft Office Products _____

12. About how many hours per week do you spend on the computer?
0 to 10 _____ 11 to 25 _____ 26 or More _____

13. What computer platform do you usually use? [e.g., Mac, Windows, etc.]
_____

14. What Internet browser(s) do you usually use? [e.g., Firefox, Edge, Chrome, etc.]
_____

15. In the last month, how often have you used an electronic health record?
_____

16. How many years have you used an electronic health record?
_____

17. How many EHRs do you use or are you familiar with? _____

18. How does your work environment record/retrieve patient records?

On Paper _____ Some Paper/Some Electronic _____ All Electronic _____

Contact Information

Those are all the questions I have for you.
Would you be able to participate on October 10, 2023?

May I get your contact information?

□ Name of participant:

□ Address:

□ City, State, Zip:

□ Daytime phone number:

□ Email address:

This study will take place at 1930 Martin Luther King Jr Ave SE.

Appendix 2: PARTICIPANT DEMOGRAPHICS

The report should contain a breakdown of the key participant demographics. A representative list is shown below.

Following is a high-level overview of the participants in this study.	
Gender	
Men	3
Women	8
Total (participants)	11
Occupation/Role	
Physician	6
Nurse	2
Office Staff	3
Total (participants)	11
Years of Experience w/EHRUT (Avg)	
Years' experience	5.5
Facility Use of EHR	
All paper	0
Some paper, some electronic	0
All electronic	11
Total (participants)	11

Appendix 3: EXAMPLE MODERATOR'S GUIDE

***EHRUT* Usability Test**

Moderator's Guide

Date: 10/10/2023
Time: 40 mins

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

After each participant:
 Collect scoring comment sheets

After all testing
 Distribute Questionnaire

Orientation

The Usability Testing is a test of our system, not your performance. We welcome both positive and negative feedback on your experience navigating through the tasks that follow.

This exercise focuses on tasks typically conducted on an EHR.

A specific task may or may not be included in your manual, according to your assigned role and your typical office workflow. Most of these tasks will already be familiar to you. Please complete them to the best of your ability. If you need help with a task, screenshots are provided to guide you through the process. If you use the screenshots, it is important to follow the numbered steps for each section in order to achieve the expected results. You should be aware that in many cases, problems and contraindications are meant to be generated. This is to test our system for use in real office situations.

A successfully completed task will be indicated by the expected appearance of the entry in the patient record.

To judge the system's ease of use, we ask you to record the time it takes to complete the tasks. When I say "BEGIN", please start your timer. When you have finished each task, please stop your timer.

If you find you are totally unable to complete the task and don't wish to continue with it, say aloud "QUIT".

At the end of each task, you will be asked to record your time and to score the task on a provided scorecard. Each task has 3 criteria to rank from 0-5:

Very Easy = 5; Easy = 4; Average = 3; Slightly Difficult = 2; Very Difficult; Deficient = 0

Any score below 3 will trigger a return to the developer for corrections. You will also have an opportunity to add comments about each section. These comments will be helpful to us in refining our system.

You have been assigned a specific patient in the system. Sign on using your assigned tester **User Name** and **Password**. Choose and open the patient assigned to you. The Patient's Initial visit has already been created in the system.

Now we will begin the Tasks being tested.

Remember, this is a **test of our system**, not your performance. We are attempting to measure our system's ease of use in an attempt to make it better and more intuitive with each iteration.

- Before each Task, take a moment to read the boxed information at the top. This should contain everything you need to know to perform the task. If necessary, you may consult the screenshots walking you through each task.
- Please use the patient information provided to complete the tasks. The information is found in the Task Box preceding each task and in the Patient Spec Sheet assigned to you.
- Feel free to use your own experience with the system to complete the task in the most efficient way for you.
- Remember to stop your timer when the task is completed.
- If you need assistance, raise your hand. If you absolutely cannot perform the task and do not wish to continue with it, say QUIT.
- Please fill out your scoresheet, including your time, after each Task.

When the group is done with one task, I will allow some time to review the instructions for the next task. Wait for me to say BEGIN to start the actual work.

Task 1. Demographics
While in your patient's record, click PT PROFILE, then DEMOGRAPHICS.
① Verify the Birth Sex - **Male**
② Select Race from pull-down – **West Indian**. (Selected Race will auto fill with **African American**.) Note: If Patient specifies mixed race, two races may be selected.
③ Select Gender Identity from pull-down – **Identifies as Male**
④ Select Preferred Language from pull-down - **English**
⑤ Select Ethnicity from pull-down – **Not Hispanic or Latino**
⑥ Select Sexual Orientation from pull-down – **Lesbian, Gay or Homosexual**

Enter Time, Score and Comments on Scoresheet.

Task 1: Demographics

Goal Task Time: 2:20 Minutes **Actual Average Time:** 1:19 Minutes
Optimal Path: *Patient Chart* □□*Edit* □□*Save*

4 Correct
□ Minor Deviations / Cycles: Describe below

□ Major Deviations: Describe below

Observed Errors and Verbalizations:
Comments: Described as "easy" with some discussion of new requirements.

Average Rating:
Overall, this task was: 4.89
Very Easy = 5; Easy = 4; Average = 3; Slightly Difficult = 2; Very Difficult = 1; Deficient = 0

Administrator / Notetaker Comments:
All users very familiar with screen. _____

Task 2. Implantable Device
Under **Procedures**, enter the **Procedure Concept Code** from **Notepad** file:
Procedure Concept Code: H0004
Click the **blue + sign** next to the Procedure to be taken to the UDI entry screen.
From Notepad, **enter the Universal Device Identifier**:
UDI Code = (01)10884521062856(11)141231(17)150707(10)A213B1(21)1234

Enter Time, Score and Comments on Scoresheet.

Task 2: Implantable Device

Goal Task Time: 3:36 Minutes **Actual Average Time:** 1:38 Minutes
Optimal Path: *Patient Chart □□ Patient Device □□ Edit □□Save □□Patient Procedure (9-dots App Launcher) □□ CPT Code □□ Select Device □□ Save*

4 Correct
4 Minor Deviations / Cycles: Describe below
Some issues finding the icon to go to the next screen after entering Procedures.

4 Major Deviations: Describe below
After entering UDI, 2nd Save was overlooked.

Observed Errors and Verbalizations:
Comments:

Average Rating:
Overall, this task was: 3.67
Very Easy = 5; Easy = 4; Average = 3; Slightly Difficult = 2; Very Difficult = 1; Deficient = 0

Administrator / Notetaker Comments:
May want to reformat these screens to make more intuitive.

Task 3. Medication list
Add current Medication to record, **Lanoxin 125mcg**, **1 tablet once a day**.
Use **any date previous** to current date of service.
Add to Current Medications.
Then **edit** that entry from 1 tablet once a day **to 1 tablet 2x daily**.

Enter Time, Score and Comments on Scoresheet.

Task 3: Medication list

Goal Task Time: 3:55 Minutes **Actual Average Time:** 1:46 Minutes
Optimal Path: *Patient Chart □□Medical Orders -> NewCROP Prescription □□New □□Enter drug keyword □□"Drug Search" Button □□ Click on selected med □□ Click "Edit" □□ Add dosing information □□ "Save Rx" Button □□ Check box next to med □□ "Select to Move to Current Meds" □□ Click "Edit" to make required edit □□ "Save Rx" □□ click Close*

4 Correct
4 Minor Deviations / Cycles: Describe below
Physicians had some issues following task instructions as it is usually performed by other staffers.

□ Major Deviations: Describe below

Observed Errors and Verbalizations:
Comments:

Average Rating:
Overall, this task was: 4.36

Very Easy = 5; Easy = 4; Average = 3; Slightly Difficult = 2; Very Difficult = 1; Deficient = 0

Administrator / Notetaker Comments:
Generally worked well. Note – this capability is provided by an outside vendor.

Task 4. Clinical Decision Support
Add new active Alert

Description: (#). Screen for High Blood Pressure
Text: **Screen for High Blood Pressure**
Select Problem triggering alert: **Navigate to Medical Examination Vitals and record the Systolic pressure above 250 mm/hg**
Save

Edit the Alert to change the age range from 80-120 to 160-500.

Enter Time, Score and Comments on Scoresheet.

Task 4: Clinical Decision Support

Goal Task Time: 3:47 Minutes **Actual Average Time:** 3:46 Minutes

Optimal Path: *Patient Chart □□Click on Medical Examination □□ Select Vitals □□ Enter Systolic as 250 and select units mm/hg □□ Save □□ Alert Toast message is displayed □□ Review and Close*

4 Correct
4 Minor Deviations / Cycles: Describe below
Some confusion with 2 instances of User Roles and Activation buttons.

□ Major Deviations: Describe below

Observed Errors and Verbalizations:
Comments: None

Average Rating:
Overall, this task was: 4.07

Very Easy = 5; Easy = 4; Average = 3; Slightly Difficult = 2; Very Difficult = 1; Deficient = 0

Administrator / Notetaker Comments:
Generally worked well. May require extra training.

Appendix 4: 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**

Final Questions

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 in this application?

Compare this system to other systems you have used.

Would you recommend this system to your colleagues?