EHR Usability Test Report of CONTINUUM 2.0

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

CONTINUUM 2.0

Date of Usability Test:	2.3.2020 and 2.5.2020
Date of Report:	2.7.2020
Report Prepared By:	the Montrose Center
	Ann J Robison
	713.800.0900
	arobison@montrosecenter.org
	401 Branard Street, 2nd Floor
	Houston, TX 77006

Table of Contents

1. EXECUTIVE SUMMARY

A usability test of CONTINUUM 2.0 Ambulatory modular EHR for a behavioral health clinic was conducted on 2.3.2020 and 2.5.2020 at 401 Branard Street, Room 326, Houston, TX 77006 by the Montrose Center. 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 administrative staff from the target demographic criteria served as participants and used the EHRUT in simulated, but representative tasks.

This study collected performance data on 13 tasks typically conducted on an EHR:
- Searching for a client and finding information on the Client Workspace
- A5 Demographics
  - Record preferred language, date of birth, birth sex, race, ethnicity, sexual orientation, gender identity
  - Change preferred language, date of birth, birth sex, race, ethnicity, sexual orientation, gender identity
  - Access preferred language, date of birth, birth sex, race, ethnicity, sexual orientation, gender identity
- A6 Problem List
  - Record a problem to the problem list
  - Change a problem on the problem list
  - Access and display the active problem list
- A7 Medication list
  - Record a medication to the medication list
  - Change a medication on the medication list
  - Access and display the active medication list
- A8 Medication allergy list
  - Record a medication allergy to the medication allergy list
  - Change a medication allergy on the medication allergy list
  - Access and display the active medication allergy list

During the 1 hour 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. Nine participants had prior experience with the EHR. All participants had basic training on the system – what was on the dashboard, each tab's purpose and how to log in.

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 recorded user performance data on paper and electronically. The administrator did not give the participant assistance in how to complete the tasks.

Participant screens, head shots and audio were recorded for subsequent analysis. The following types of data were collected for each participant:
- Number of tasks successfully completed within the allotted time without assistance
- Time to complete the tasks
- Number and types of errors
- Path deviations
- Participant's verbalizations
- Participant's satisfaction ratings of the system

All participant data was de-identified – no correspondence could be made from the identity of the participant to the data collected. Following the conclusion of the testing, participants were asked to complete a post-test questionnaire and were compensated by having either given a billable hour credit or a gift certificate worth the same amount for the student intern. 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. Table 1

Measures	N	Task Success	Path Deviations	Task Time		Errors	Task Ratings 5 = Easy
Tasks	#	Mean (SD)	Deviations (Observed/ Optimal)	Mean (SD)	Deviations (Observed/ Optimal)	Mean (SD)	Mean (SD)
Searching for a client and finding information on the Client Workspace	10	100.00 (0.00)	0.97	14.99 (11.35)	1.00	0.30 (0.48)	1.00 (0.00)
Record preferred language, date of birth, birth sex, race, ethnicity, sexual orientation, gender identity	10	90.00 (31.62)	1.07	109.35 (43.35)	0.81	0.70 (1.06)	2.30 (0.95)
Change preferred language, date of birth, birth sex, race, ethnicity, sexual orientation, gender identity	10	100.00 (0.00)	1.05	46.74 (23.95)	0.52	0.80 (1.03)	1.40 (0.84)
Access preferred language, date of birth, birth sex, race, ethnicity, sexual orientation, gender identity	10	100.00 (0.00)	1.25	22.39 (26.32)	0.75	0.70 (1.16)	1.00 (0.00)
Record a problem to the problem list	10	90.00 (31.62)	1.16	92.39 (42.64)	0.68	1.20 (2.04)	1.60 (0.52)
Change a problem on the problem list	10	90.00 (31.62)	1.14	61.10 (29.84)	0.54	1.60 (2.41)	1.20 (0.42)
Access and display the active problem list	10	90.00 (31.62)	1.12	16.97 (6.45)	0.57	1.30 (2.00)	1.00 (0.00)
Record a medication to the medication list	10	90.00 (31.62)	1.04	62.10 (21.34)	0.69	0.50 (1.08)	1.80 (1.14)
Change a medication on the medication list	10	90.00 (31.62)	1.01	43.38 (19.47)	0.64	0.50 (1.08)	1.50 (0.85)
Access and display the active medication list	10	90.00 (31.62)	1.02	16.73 (7.11)	0.56	0.70 (1.16)	1.20 (0.42)
Record a medication allergy to the medication allergy list	10	90.00 (31.62)	1.03	61.66 (27.51)	0.69	0.30 (0.48)	1.60 (0.97)
Change a medication allergy on the medication allergy list	10	100.00 (0.00)	1.02	36.59 (19.06)	0.54	0.20 (0.42)	1.20 (0.42)
Access and display the active medication allergy list	10	100.00 (0.00)	1.02	14.48 (5.38)	0.48	0.70 (1.16)	1.00 (0.00)

The results from the Likert System Usability Scale scored the subjective satisfaction with the system based on performance with these tasks to be: 4.6.

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

- Major findings
   o More choices are needed for gender and sexual orientation.
   o Expand number of clients that can be seen on client list.
   o The "books" used to form the problem definition, goals, strategies and objectives need to be collapsed into a more manageable list with less choices and less duplication.
   o When printing a treatment plan review under the problem, it should just print the problem, goals, strategies and object and the most recent review not all from the beginning.
   o When adding new problems, the order number should default to the next available number.

- o Boxes for the problem definition list and goal list need to be able to size to be able to see all options.
  - o Move save button to the end of the goals.
  - o Dosage needs to be added as a discrete field under medications.
  - o A drop down for types of adverse reactions is needed.
  - o Type of reaction is missing in the adverse reactions entry screen but it is listed in the list.
  - o Move preferred language next to race.
  - o Change label of Orientation to Sexual Orientation.
- Areas for improvement
  - o Add assessment.
  - o Finish client portal.
  - o Improve time out function.

2. INTRODUCTION

The EHRUT tested for this study was CONTINUUM 2.0 Ambulatory (Behavioral Health). Designed to present clinical information to behavioral health providers in outpatient behavioral health clinics, the EHRUT consists of demographics and contact information, external provider information, client reminders, emergency contacts, encounter progress notes, insurance billing data, income and sliding scale fee data, time reporting data, measurement data, smoking status, intimate partner violence and sexual assault trauma information, tracking referrals, internal auditing, importing and exporting to report to governmental grant reporting systems, electronic sign in, clinical quality reports, e-prescribing add on module, intake and measures analysis, client lists, financial and time reporting, appointment setting, family history, ICD10 diagnosis, treatment planning, housing status and other social determinants of health, medication list, client education resources, allergies and adverse drug reaction list, immunization list, test result list, imaging list, order list and upload of external documents. It also includes features to assign staff and program information. The usability testing attempted to represent realistic exercises and conditions for searching for a client, demographics, problem list, medications and allergies and adverse drug reactions.

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 the number of clicks to accomplish a task, the time taken for a task and the staff satisfaction with a task, were captured during the usability testing.

3. METHOD

3.1 PARTICIPANTS

A total of 10 participants were tested on the EHRUT. Participants in the test were case managers, therapists, eligibility staff and back office staff. Participants were recruited by the Montrose Center which is the user of the system and were compensated billable hours or $100 for their time. In addition, participants had no direct connection to the development of or organization producing the EHRUT. The Montrose Center is the purchaser of the product not the developer. 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 5.2.

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. Table 2

		Gender		Education	Occupation/ role	Professional Experience (mos)	Computer Experience (mos)	Product Experience (mos)	Assistive Technology Needs
1	ID01	Female		BA	Case Manager	4	300	4	N
2	ID02	Female		MA	Therapist	60	204	12	N
3	ID03	Female		MSW	Therapist	18	399	18	N
4	ID04	Male		BA	Report Runner	9	324	0	N
5	ID05	Female		BA	Clinical Intern	5	240	5	N
6	ID06	Male		MSW	Therapist	300	408	72	N
7	ID07	Male		MA	Therapist	120	240	60	N
8	ID08	Female		HS Diploma	Eligibility Spec	105	228	72	N
9	ID09	Female		MSW	Case Manager	9	261	9	N
10	ID10	Male		MHA	Case Management Supervisor	60	220	16	N

Ten participants (matching the demographics in the section on Participants) were recruited and ten showed up and participated in the usability test. None participants failed to show for the study.

Participants were scheduled for 50 minute sessions with 10 minutes in between each session for debrief by the administrator and data logger, 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.

3.2 STUDY DESIGN

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

During the usability test, participants interacted with one EHR. Each participant used the system in the same location, 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.

3.3 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:
• Searching for a client and finding information on the Client Workspace

- A5 Demographics
  - o Record preferred language, date of birth, birth sex, race, ethnicity, sexual orientation, gender identity
  - o Change preferred language, date of birth, birth sex, race, ethnicity, sexual orientation, gender identity
  - o Access preferred language, date of birth, birth sex, race, ethnicity, sexual orientation, gender identity
- A6 Problem List
  - o Record a problem to the problem list
  - o Change a problem on the problem list
  - o Access and display the active problem list
- A7 Medication list
  - o Record a medication to the medication list
  - o Change a medication on the medication list
  - o Access and display the active medication list
- A8 Medication allergy list
  - o Record a medication allergy to the medication allergy list
  - o Change a medication allergy on the medication allergy list
  - o Access and display the active medication allergy list

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

Tasks should always be constructed in light of the study objectives.

3.4 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 that the test ran smoothly, two staff members participated in this test, the usability administrator and the data logger. The usability testing staff conducting the test was experienced usability practitioners with 10 years' experience conducting focus groups with behavioral health providers using an electronic health record. She has a PhD in Public Health. The data logger had 1 year experience in documenting tasks..

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 tasks (see specific instructions 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 written 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), compensated them for their time, and thanked each individual for their participation.

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

Participants were thanked for their time and compensated. Participants signed a receipt and acknowledgement form (See Appendix 6) indicating that they had received the compensation.

3.5 TEST LOCATION

The test facility included a waiting area and a quiet testing room with a table, computer for the participant, and recording computer for the administrator. Only the participant and administrator were in the test room. The data logger worked from a separate room where they could see the participant's screen and face shot, and listen to the audio of the session. 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 visible to the participants.

3.6 TEST ENVIRONMENT

The EHRUT would be typically be used in a healthcare office or facility. In this instance, the testing was conducted in the board room of a behavioral health facility. For testing, the computer used a laptop running Windows 10.

The participants used laptop mouse pad and keyboard when interacting with the EHRUT.

CONTINUUM used a display including 15" display screen, set to 1440 x 900 resolution and HD color settings. The application was set up by the Center's IT staff according to the administrator's documentation describing the system set-up and preparation. The application itself was running on a Chrome platform 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).

3.7 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
4. Incentive Receipt and Acknowledgment Form

Examples of these documents can be found in Appendices 3-6 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 web camera recorded each participant's facial expressions synced with the screen capture, and verbal comments were recorded with a microphone using Zoom. The test session were electronically transmitted to a nearby observation room where the data logger observed the test session.

3.8 PARTICIPANT INSTRUCTIONS

The administrator reads the following instructions aloud to the each participant (also see the full moderator's guide in Appendix 5.4):

Thank you for participating in this study. Your input is very important. Our session today will last about 50 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 will be 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 time (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 that 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 13 tasks to complete. Tasks are listed in the moderator's guide in Appendix 5.4.

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

3.10 DATA SCORING

The following table (Table 3) details how tasks were scored, errorsevaluated, 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

Measures	Rationale and Scoring
	conditions, is recorded when constructing tasks. Target task times used for task times in the Moderator's Guide have been operationally defined by taking multiple measures of optimal performance and multiplying by 1.25 to allow a time buffer because the participants are not trained to expert performance. Thus, if expert, optimal performance on a task was 15 seconds then allotted task time performance was 15 * 1.25 or 18.75 seconds. This ratio has been 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 were counted as errors. This has been expressed as the mean number of failed tasks per participant. On a qualitative level, an enumeration of errors and error types have been collected.
Efficiency: Task Deviations	The participant's path (i.e., steps) through the application was recorded. Deviations occur if the participant, for example, went to a wrong screen, clicked on an incorrect menu item, followed an incorrect link, or interacted incorrectly with an on-screen control. This path was compared to the optimal path. The number of steps in the observed path is divided by the number of optimal steps to provide a ratio of path deviation. Task deviations be reported. Optimal paths (i.e., procedural steps) are recorded when constructing tasks.
Efficiency: Task Time	Each task was timed from when the administrator said "Begin" until the participant said, "Done." If they 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.
Satisfaction: Task Rating	Participant's subjective impression of the ease of use of the application was measured by administering both a simple post-task question as well as a post-session questionnaire. 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 CONTINUM 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 5.

4. RESULTS

4.1 DATA ANALYSIS AND REPORTING

The results of the usability test were calculated according to the methods specified in the Usability Metrics section above. Participants who failed to follow session and task instructions had their data excluded from the analyses of some tasks. One participant recorded the diagnosis instead of the problem. One participant recorded the Medication Allergies and Adverse Reactions instead of Medications. There were no testing irregularities.

The usability testing results for the EHRUT are detailed below (Table 4). 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.

Measures	N	Task Success	Path Deviations	Task Time		Errors	Task Ratings 5 = Easy
Tasks	#	Mean (SD)	Deviations (Observed/ Optimal)	Mean (SD)	Deviations (Observed/ Optimal)	Mean (SD)	Mean (SD)
Searching for a client and finding information on the Client Workspace	10	100.00 (0.00)	0.97	14.99 (11.35)	1.00	0.30 (0.48)	1.00 (0.00)
Record preferred language, date of birth, birth sex, race, ethnicity, sexual orientation, gender identity	10	90.00 (31.62)	1.07	109.35 (43.35)	0.81	0.70 (1.06)	2.30 (0.95)
Change preferred language, date of birth, birth sex, race, ethnicity, sexual orientation, gender identity	10	100.00 (0.00)	1.05	46.74 (23.95)	0.52	0.80 (1.03)	1.40 (0.84)
Access preferred language, date of birth, birth sex, race, ethnicity, sexual orientation, gender identity	10	100.00 (0.00)	1.25	22.39 (26.32)	0.75	0.70 (1.16)	1.00 (0.00)
Record a problem to the problem list	10	90.00 (31.62)	1.16	92.39 (42.64)	0.68	1.20 (2.04)	1.60 (0.52)
Change a problem on the problem list	10	90.00 (31.62)	1.14	61.10 (29.84)	0.54	1.60 (2.41)	1.20 (0.42)
Access and display the active problem list	10	90.00 (31.62)	1.12	16.97 (6.45)	0.57	1.30 (2.00)	1.00 (0.00)
Record a medication to the medication list	10	90.00 (31.62)	1.04	62.10 (21.34)	0.69	0.50 (1.08)	1.80 (1.14)
Change a medication on the medication list	10	90.00 (31.62)	1.01	43.38 (19.47)	0.64	0.50 (1.08)	1.50 (0.85)
Access and display the active medication list	10	90.00 (31.62)	1.02	16.73 (7.11)	0.56	0.70 (1.16)	1.20 (0.42)
Record a medication allergy to the medication allergy list	10	90.00 (31.62)	1.03	61.66 (27.51)	0.69	0.30 (0.48)	1.60 (0.97)
Change a medication allergy on the medication allergy list	10	100.00 (0.00)	1.02	36.59 (19.06)	0.54	0.20 (0.42)	1.20 (0.42)
Access and display the active medication allergy list	10	100.00 (0.00)	1.02	14.48 (5.38)	0.48	0.70 (1.16)	1.00 (0.00)

The results from the Likert SUS (System Usability Scale) scored the subjective satisfaction with the system based on performance with these tasks to be: 4.6.

4.2 DISCUSSION OF THE FINDINGS

EFFECTIVENESS

Based on the success, failure and path deviation data; more training will be developed for new users. For similar functions, users improved their speed and accuracy in subsequent tests.

EFFICIENCY

Based on the observations of the task time and deviation data, more training will be developed for new users. For similar functions, users improved their speed and accuracy in subsequent tests.

SATISFACTION

Based on the task ratings and SUS results data of an average of 4.6, this product is highly useable and testers were satisfied.

MAJOR FINDINGS

o More choices are needed for gender and sexual orientation – the Center primarily serves the LGBTQ community and therefore needs a wider range of genders. Pangender and GenderQueer where added.
o Expand number of clients that can be seen on client list – the programmer has added a function to select how many clients to display.
o The "books" used to form the problem definition, goals, strategies and objectives need to be collapsed into a more manageable list with less choices and less duplication – the "books" have repetitive problems for different populations that result in similar goals, strategies and objectives but make it cumbersome to pick through the long list. Books that are not being used will be deleted and others deduplciated.
o When printing a treatment plan review under the problem, it should just print the problem, goals, strategies and object and the most recent review not all from the beginning – the programmer has been adjusted this feature.
o When adding new problems, the order number should default to the next available number – the programmer has been adjusted this feature.
o Boxes for the problem definition list and goal list need to be able to size to be able to see all options – the programmer has been adjusted this feature.
o Move save button to the end of the goals – the programmer has been adjusted this feature.
o Dosage needs to be added as a discrete field under medications – the programmer has been adjusted this feature.
o A drop down for types of adverse reactions is needed – the programmer has been adjusted this feature.
o Type of reaction is missing in the adverse reactions entry screen but it is listed in the list – the programmer has been adjusted this feature.
o Move preferred language next to race – the programmer has been adjusted this feature.
o Change label of Orientation to Sexual Orientation – the programmer has been adjusted this feature.

AREAS FOR IMPROVEMENT

o Add assessment – this feature will be added once testing is complete.
o Finish client portal – this feature will be completed once testing is complete.
o Improve time out function – the programmer has been adjusted this feature.

5. 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: Informed Consent Form
4: Example Moderator's Guide
5: System Usability Scale Questionnaire
6: Incentive receipt and acknowledgment form

5.1 RECRUITING SCREENER

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 would like to participate. This should only take a few minutes of your time. This is strictly for research purposes. If you are interested and qualify for the study, you will be paid to participate. Can I ask you a few questions?

Please complete the participant demographic questionnaire. (see 5.2)

Exclusion Questions:
o Have you participated in a focus group or usability test in the past *6* months? [If yes, Terminate]
o Do you, or does anyone in your home, work in marketing research, usability research, web design [...etc.]? [If yes, Terminate]
o 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]

Demographics
Participant ID: _____ **Credentials** (if applicable): _____
Gender: ☐ Male ☐ Female ☐ Male-to-Female ☐ Female-to-Male ☐ Gender Queer
Age: ☐ 10-19 ☐ 20-29 ☐ 30-39 ☐ 40-49 ☐ 50-59 ☐ 60-69 ☐ 70-79
Ethnicity: ☐ Latinx ☐ Non-Latinx **Race:** ☐ Amer Indian/Alaskan Native ☐ Anglo ☐ Asian ☐ Black ☐ Native Hawaiian/Pacific Islander
Highest Level of Education: ☐ High School graduate/GED ☐ Some College
☐ Bachelors ☐ Masters ☐ Other _____
Occupation: _____ **Professional Experience in months:** _____
Is there any assistive technology needed to utilize a software? ☐ Yes ☐ No If yes, what is it? _____

o Describe your work location (or affiliation) and environment? (Recruit according to the intended users of the application) [e.g., behavioral health]

Computer Expertise
o Besides reading email, what professional activities do you do on the computer? [e.g., access EHR, research; reading news; shopping/banking; digital pictures; programming/word processing, etc.] [If no computer use at all, Terminate]
o About how many hours per week do you spend on the computer? [Recruit according to the demographics of the intended users, e.g., 0 to 10, 11 to 25, 26+ hours per week]
o What computer platform do you usually use? [e.g., Mac, Windows, etc.]
o What Internet browser(s) do you usually use? [e.g., Firefox, IE, AOL, etc.]
o In the last month, how often have you used an electronic health record?
o How many years have you used an electronic health record?
o How many EHRs do you use or are you familiar with?
o How does your work environment patient records? [Recruit according to the demographics of the intended users]
☐ On paper   ☐ Some paper, some electronic   ☐ All electronic
o How many months of experience do you have using CONTINUUM?

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.
For your participation, you will be paid $100 or a billable hour worth $100.
Would you be able to participate on 2.3.20 or 2.5.20? [If so collect contact information]

May I get your contact information?
☐ Name of participant:
☐ Daytime 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 in room 326. I will confirm your appointment a couple of days before your session and provide you with directions to our office. What time is the best time to reach you?

5.2 PARTICIPANT DEMOGRAPHICS

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

Credentials			Education	
LMSW	2		High School/GED	1
LPC	2		Some College	0
LCSW	1		Bachelors	2
None	5		Masters	7
Total Participants	10		Total Participants	10
Gender			**Occupation/Role**	
Male	4		Therapist	4
Female	5		Case Manager	3
Gender Queer	1		Student Intern	1
Total Participants	10		Administrative Staff	2
			Total Participants	10
Age			**Yrs of Professional Experience**	
20-29	2		<1	4
30-39	5		1-5	3
40-49	1		6-10	2
50-59	0		>10	1
60-69	2		Total Participants	10
Total Participants	10			
Ethnicity			**Race**	
Latinx	2		American Indian/Alaskan Native	0
Non-Latinx	8		Anglo	7
Total Participants	10		Asian	1
Facility Use of EHR			Black	3
All paper	0		Native Hawaiian/Pacific Islander	0
Some paper, some electronic	10		Total Participants	10
All electronic	0			
Total Participants	10			

5.3 INFORMED CONSENT

The Montrose Center 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 60 minutes. At the conclusion of the test, you will be compensated for your time through staff hours or a gift card if you are a student.

Agreement
I understand and agree that as a voluntary participant in the present study conducted by the Montrose Center I am free to withdraw consent or discontinue participation at any time. I understand and agree to participate in the study conducted and recorded through Zoom by the Montrose Center.

I understand and consent to the use and release of the recording by the Montrose Center. I understand that the information and recording 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 recoding and understand the videotape may be copied and used by the Montrose Center 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 the Montrose Center. 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: _____/_____/_____**

EHRUT Usability Test
5.4 MODERATOR'S GUIDE

Administrator _____

Data Logger _____

Date: _____/_____/_____
Time _____

Participant # _____
Location <u>room 326</u>

<u>Prior to testing:</u>
☐ Confirm schedule with Participants
☐ Ensure EHRUT lab environment is running properly
☐ Ensure lab and data recording equipment is running properly
☐ Set up TV monitor

<u>Prior to each participant:</u>
☐ Reset application
☐ Start session recordings with Zoom

<u>Prior to each task:</u>
☐ Return to Dashboard to reset application to starting point for next task

<u>After each participant:</u>
☐ End session recordings with Zoom

<u>After all testing</u>
☐ Back up all Zoom and data files

Orientation (10 minutes)
Thank you for participating in this study. Our session today will last 60 **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 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 its creation, so please be honest with your opinions.

The product you will be using today is *describe the state of the application, i.e., production version, early prototype, etc*. Some of the data may not make sense as it is placeholder data.

We are recording the audio and screenshots of our session 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 job title / appointment?
How long have you been working in this role?
What are some of your main responsibilities?

Tell me about your experience with electronic health records.

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.

Show test participant the EHRUT.
Please don't click on anything just yet. What do you notice? What are you able to do here?
Please be specific.
Notes / Comments:

Start Zoom recording
Take the participant to the starting point for the task.

Task 1: Search for client (15 Seconds)   **Participant#: ___**

To set up a client, we need to find them in the system. Please find client _____

Success:
☐ Yes ☐ No
☐ Easily completed
☐ Completed with difficulty or help Describe below
☐ Not completed
Comments:

Task Time: _____ Seconds
Number of steps taken: _____
Number of deviations: _____

Optimal Path: Dashboard, enter last name, search, view
☐ Correct
☐ Minor Deviations / Cycles Describe below
☐ Major Deviations Describe below
Comments:

Observed Errors and Verbalizations:
Comments:

Number of errors: _____

Rating: Overall, this task was: _____
Show participant written scale: "Very Easy" (1) to "Very Difficult" (5)

Administrator / Notetaker Comments:

Task 2: Record Demographics (135 *Seconds*)   **Participant#: ___**

Take the participant to the starting point for the task.

Success:
☐ Yes ☐ No
☐ Easily completed
☐ Completed with difficulty or help Describe below
☐ Not completed
Comments:

Task Time: _____ Seconds
Number of steps taken: _____
Number of deviations: _____

Optimal Path: Dashboard, enter last name, search, view
View detail, enter date of birth, enter preferred language, enter birth sex, enter gender, enter sexual orientation, enter race and subrace, enter ethnicity and subethnicity, save, go back
☐ Correct
☐ Minor Deviations / Cycles Describe below
☐ Major Deviations Describe below
Comments:

Observed Errors and Verbalizations:
Comments:

Number of errors: _____

Rating:
Overall, this task was: __
Show participant written scale: "Very Easy" (1) to "Very Difficult" (5)

Administrator / Notetaker Comments:

Task 3: Change Demographics (90 Seconds)   **Participant#: ___**

Take the participant to the starting point for the task.

Success:
☐ Yes ☐ No
☐ Easily completed
☐ Completed with difficulty or help Describe below
☐ Not completed
Comments:

Task Time: _____ Seconds
Number of steps taken: _____
Number of deviations: _____

Optimal Path: Dashboard, enter last name, search, view
View detail, change date of birth, change preferred language, change birth sex, change gender, change sexual orientation, change race and subrace, change ethnicity and subethnicity, save, go back
☐ Correct
☐ Minor Deviations / Cycles Describe below
☐ Major Deviations Describe below
Comments:

Observed Errors and Verbalizations:
Comments:

Number of errors: _____

Rating:
Overall, this task was: __
Show participant written scale: "Very Easy" (1) to "Very Difficult" (5)

Administrator / Notetaker Comments:

Task 4: Access and display demographics (30 Seconds)   **Participant#: ___**

Take the participant to the starting point for the task.

Success:
☐ Yes ☐ No
☐ Easily completed
☐ Completed with difficulty or help Describe below
☐ Not completed
Comments:

Task Time: _____ Seconds
Number of steps taken: _____
Number of deviations: _____

Optimal Path: Dashboard, enter last name, search, view
View detail, change date of birth, change preferred language, change birth sex, change gender, change sexual orientation, change race and subrace, change ethnicity and subethnicity, save, go back
☐ Correct
☐ Minor Deviations / Cycles Describe below
☐ Major Deviations Describe below
Comments:

Observed Errors and Verbalizations:
Comments:

Number of errors: _____

Rating:
Overall, this task was: __
Show participant written scale: "Very Easy" (1) to "Very Difficult" (5)

Administrator / Notetaker Comments:

Task 5: Record Problem (135 *Seconds*)   **Participant#: ___**

Take the participant to the starting point for the task.

Success:
☐ Yes ☐ No
☐ Easily completed
☐ Completed with difficulty or help Describe below
☐ Not completed
Comments:

Task Time: _____ Seconds
Number of steps taken: _____
Number of deviations: _____

Optimal Path: Dashboard, enter last name, search, view
Problem tab, new problem, problem type, planner type, problem group, problem statement, check box, transfer, check goal box, transfer, save, go back
☐ Correct
☐ Minor Deviations / Cycles Describe below
☐ Major Deviations Describe below
Comments:

Observed Errors and Verbalizations:
Comments:

Number of errors: _____

Rating:
Overall, this task was: __
Show participant written scale: "Very Easy" (1) to "Very Difficult" (5)

Administrator / Notetaker Comments:

Task 6: Change Problem (112.5 Seconds)   **Participant#: ___**

Take the participant to the starting point for the task.

Success:
☐ Yes ☐ No
☐ Easily completed
☐ Completed with difficulty or help Describe below
☐ Not completed
Comments:

Task Time: _____ Seconds
Number of steps taken: _____
Number of deviations: _____

Optimal Path:
Dashboard, enter last name, search, view
Problem tab, view problem, problem type, planner type, problem group, problem statement, check box, transfer, check goal box, transfer, save, go back
☐ Correct
☐ Minor Deviations / Cycles Describe below
☐ Major Deviations Describe below
Comments:

Observed Errors and Verbalizations:
Comments:

Number of errors: _____

Rating:
Overall, this task was: __
Show participant written scale: "Very Easy" (1) to "Very Difficult" (5)

Administrator / Notetaker Comments:

Task 7: Access and display problem (30 Seconds)   **Participant#: ___**

Take the participant to the starting point for the task.

Success:
☐ Yes ☐ No
☐ Easily completed
☐ Completed with difficulty or help Describe below
☐ Not completed
Comments:

Task Time: _____ Seconds
Number of steps taken: _____
Number of deviations: _____

Optimal Path:
Dashboard, enter last name, search, view
Problem tab, view problem, go back
☐ Correct
☐ Minor Deviations / Cycles Describe below
☐ Major Deviations Describe below
Comments:

Observed Errors and Verbalizations:
Comments:

Number of errors: _____

Rating:
Overall, this task was: __
Show participant written scale: "Very Easy" (1) to "Very Difficult" (5)

Administrator / Notetaker Comments:

Task 8: Record Medication (90 *Seconds*)   **Participant#: ___**

Take the participant to the starting point for the task.

Success:
☐ Yes ☐ No
☐ Easily completed
☐ Completed with difficulty or help Describe below
☐ Not completed
Comments:

Task Time: _____ Seconds
Number of steps taken: _____
Number of deviations: _____

Optimal Path:
Dashboard, enter last name, search, view
Medical tab, medication information, add new record, enter medication, enter medication status, enter instructions, enter start date, enter stop date*, enter product name*, enter generic name*, insert
* Not required
☐ Correct
☐ Minor Deviations / Cycles Describe below
☐ Major Deviations Describe below
Comments:

Observed Errors and Verbalizations:
Comments:

Number of errors: _____

Rating:
Overall, this task was: __
Show participant written scale: "Very Easy" (1) to "Very Difficult" (5)

Administrator / Notetaker Comments:

Task 9: Change Medication (67.5 Seconds) **Participant#: ___**

Take the participant to the starting point for the task.

Success:
☐ Yes ☐ No
☐ Easily completed
☐ Completed with difficulty or help Describe below
☐ Not completed
Comments:

Task Time: _____ Seconds
Number of steps taken: _____
Number of deviations: _____

Optimal Path:
Dashboard, enter last name, search, view
Medical tab, medication information, view medication, change medication, change medication status, change instructions, change start date, change stop date*, change product name*, change generic name*, insert
* Not required
☐ Correct
☐ Minor Deviations / Cycles Describe below
☐ Major Deviations Describe below
Comments:

Observed Errors and Verbalizations:
Comments:

Number of errors: _____

Rating:
Overall, this task was: __
Show participant written scale: "Very Easy" (1) to "Very Difficult" (5)

Administrator / Notetaker Comments:

Task 10: Access and display medication (30 Seconds)   **Participant#: ___**

Take the participant to the starting point for the task.

Success:
☐ Yes ☐ No
☐ Easily completed
☐ Completed with difficulty or help Describe below
☐ Not completed
Comments:

Task Time: _____ Seconds
Number of steps taken: _____
Number of deviations: _____

Optimal Path:
Dashboard, enter last name, search, view
Medical tab, medication information, view medication
☐ Correct
☐ Minor Deviations / Cycles Describe below
☐ Major Deviations Describe below
Comments:

Observed Errors and Verbalizations:
Comments:

Number of errors: _____

Rating:
Overall, this task was: __
Show participant written scale: "Very Easy" (1) to "Very Difficult" (5)

Administrator / Notetaker Comments:

Task 11: Record Allergies and adverse drug reaction information (90 *Seconds*)
     Participant#: ___

Take the participant to the starting point for the task.

Success:
☐ Yes ☐ No
☐ Easily completed
☐ Completed with difficulty or help Describe below
☐ Not completed
Comments:

Task Time: _____ Seconds
Number of steps taken: _____
Number of deviations: _____

Optimal Path:
Dashboard, enter last name, search, view
Medical tab, allergies and adverse drug reaction information, add new record, enter onset date, enter allergy name, enter reaction description*, enter severity, enter status, insert
* Not required
☐ Correct
☐ Minor Deviations / Cycles Describe below
☐ Major Deviations Describe below
Comments:

Observed Errors and Verbalizations:
Comments:

Number of errors: _____

Rating:
Overall, this task was: __
Show participant written scale: "Very Easy" (1) to "Very Difficult" (5)

Administrator / Notetaker Comments:

Task 12: Change Allergies and adverse drug reaction information (67.5 Seconds)
        Participant#: ___

Take the participant to the starting point for the task.

Success:
☐ Yes ☐ No
☐ Easily completed
☐ Completed with difficulty or help Describe below
☐ Not completed
Comments:

Task Time: _____ Seconds
Number of steps taken: _____
Number of deviations: _____

Optimal Path:
Dashboard, enter last name, search, view
Medical tab, allergies and adverse drug reaction information, view allergy entry, change onset date, change allergy name, change reaction description*, change severity, change status, insert
* Not required
☐ Correct
☐ Minor Deviations / Cycles Describe below
☐ Major Deviations Describe below
Comments:

Observed Errors and Verbalizations:
Comments:

Number of errors: _____

Rating:
Overall, this task was: __
Show participant written scale: "Very Easy" (1) to "Very Difficult" (5)

Administrator / Notetaker Comments:

Task 13: Access and display **Allergies and adverse drug reaction information (30 Seconds)   Participant#: ___**

Take the participant to the starting point for the task.

Success:
☐ Yes ☐ No
☐ Easily completed
☐ Completed with difficulty or help Describe below
☐ Not completed
Comments:

Task Time: _____ Seconds
Number of steps taken: _____
Number of deviations: _____

Optimal Path:
Dashboard, enter last name, search, view
Medical tab, view allergies and adverse drug reaction entry
☐ Correct
☐ Minor Deviations / Cycles Describe below
☐ Major Deviations Describe below
Comments:

Observed Errors and Verbalizations:
Comments:

Number of errors: _____

Rating:
Overall, this task was: __
Show participant written scale: "Very Easy" (1) to "Very Difficult" (5)

Administrator / Notetaker Comments:

Final Questions (15 *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 in this application?
Compare this system to other systems you have used. Would you recommend this system to your colleagues?

Administer the SUS

5.5 SYSTEM USABILITY SCALE QUESTIONNAIRE

In 1996, Brooke published a "low-cost usability scale that can be used for global assessments of systems usability"
known as the System Usability Scale or SUS.
Lewis and Sauro (2009) and others have elaborated on the SUS over the years. Computation of the SUS score can be found in Brooke's paper, in at http://www.usabilitynet.org/trump/documents/Suschapt.doc *or in Tullis and Albert (2008).*

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

5.6 ACKNOWLEDGEMENT OF RECEIPT

I hereby acknowledge receipt of $_____ for my participation in a research study run by the Montrose Center.

Printed Name:

Signature: _____ Date: _____/_____/_____

Usability Researcher: _____

Signature of Usability Researcher: _____ Date: _____/_____/_____

Witness: _____

Witness Signature: _____ Date: _____/_____/_____