



Integrated Care EHR version 3.0

Usability Test Report

November 04, 2022

Safety Enhanced Design

EHR Usability Test Report of Integrated Care EHR version 3.0

Report based on NISTIR 7742 Customized Common Industry Format Template for Electronic Health Record Usability Testing, ISO/IEC 25062:2006 Common Industry Format for Usability Test Reports

Integrated Care EHR

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1. EXECUTIVE SUMMARY

A usability test for **Integrated Care EHR version 3.0**, which is a customized opensource electronic health record, was conducted remotely between October 01, 2022 and October 18, 2022 using a virtual meeting platform by CHN Tech Solutions LLC. The purpose of this test was to 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 personnel matching the target demographic served as participants and used the EHRUT to complete tasks that are similar to what would be seen in day-to-day activities in a healthcare clinic. Four separate, dissimilar tasks were used as a basis for the test.

1. (a)(5) Enter and modify patient demographics
2. (a)(9) Clinical Decision Support (CDS)
3. (a)(14) Add an implantable device
4. (a)(2) Order a lab test

Each usability test lasted between 40 and 60 minutes. Each User was greeted by the Proctor and asked to review and sign an informed consent and release form (included in Appendix 5.2). All participants, except one, had prior experience with EHR's, but none had prior experience with the Application being tested, although all participants were given the opportunity for familiarization training similar to that received by a real end user prior to testing. The Proctor introduced the test, and described the testing process, which is having one task at a time assigned and then completed prior to being assigned the next. During the testing, the Proctor timed the test and recorded user performance data on paper and electronically. Participant screens and audio were recorded for subsequent review and analysis to verify completion times and identify issues that the User may have experienced. The following data were collected for each User:

- Number of tasks successfully completed within the allotted time
- 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 were de-identified after the completion of the test and each assigned a User Id. No data in the report can be linked back to the participants. Upon completion of their test, each participant was asked to complete a Post-Test Questionnaire and a System Usability Scale Questionnaire, and all complied. The *NIST Guide to the Processes Approach for Improving the Usability of Electronic Health Records* was used to evaluate the usability of the EHRUT. The following is a summary of User performance as collected from each participant for each area tested.

Measure	N	Task Success	Path Deviation	Task Time		Errors	Task Ratings 5+Easy
Task	#	Mean (SD)	Deviations (Observed / Optimal)	Mean (SD) seconds	Deviations (Observed / Optimal)	Mean (SD)	Mean (SD)
1.1 Enter and Modify Demographics	10	90 (10)	1/10	83 (28)	83/108	30 (.6)	5 (0)
1.2 Clinical Decision Support (CDS)	10	100(0)	0/8	99 (57)	99/108	10(.3)	5 (0)
2. Add an Implantable Device	10	80(40)	8/4	120(123)	120/80	30(.46)	4.2(.75)
3. Order a Lab	10	90 (10)	5/10	83 (29)	83/107	1.4 (3.6)	4.2 (.75)

1.1 The results from the System Usability Scale scored

The results from the System Usability Scale scored the subjective satisfaction with the system based on performance with these tasks to be: 84.5. In addition to the performance data, the following qualitative observations were made:

1.2 Major findings

The task failures were a result of the Users not following instructions and not as a result of not being able to navigate the system. In one of the two cases, the User navigated to the correct location, opened the correct menu, but failed to select the required option. The second failure was the User entering the test data in the wrong location and was a result of being unfamiliar with the system. Both Users would be able to complete the tasks easily in the future.

Even Users who do not work with EHR's on a daily basis found the system easy to navigate with minimal guidance. All Users would recommend the system to others and found it easy to use.

User found the “Tabs” very helpful in navigating previously opened pages and found it much easier going back and forth to review Encounters/Charts and to the Calendar/Appointments. The EMR flow/dashboard flow is easy to follow.

1.3 Areas for improvement

1. Change the font size and color to make text easier to see.
2. Training will need to be improved as most of the things the Users identified as needing improvement are things that can be customized by the User in the current configuration.
3. Changing menu titles to those in use on the current EHR and changing the grouping in same areas will make the transition to a new system will make it easier for Users to transition to the new system.

2. INTRODUCTION

The EHRUT tested for this study was Integrated Care EHR version 3.0. Designed to present patient medical information to healthcare providers, the EHRUT consists of a provider facing, open source, electronic health record which is used to manage various aspects of patient care. 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 user centered design in accordance with Safety Enhanced Design certification criteria. To this end, measures of effectiveness, efficiency, and user satisfaction, such as task success and task time, were captured during the usability testing.

3. METHODS

3.1 UCD Process

NISTIR 7741 (<https://nvlpubs.nist.gov/nistpubs/Legacy/IR/nistir7741.pdf>)

3.2 PARTICIPANTS

A total of 10 participants were tested on the EHRUT. Participants in the test were a Compliance/ Quality Coordinator, a Medical Records Supervisor, a Whole Person Care Associate Director, a Medical

Assistant, a Physician, a Digital Communication Supervisor, a Patient Experience Services Specialist, a Physician Assistant, a Patient Eligibility Specialist and a Chief Administrative Officer. Participants were recruited from various CHN clinics. Participants were informed that the testing would be done virtually and would be recorded and that they could withdraw at any time. Participants completed the testing during normal work hours and received no additional compensation to their normal wages and none of the participants had direct connection to the development of, or producing, the EHRUT. Participants were given the opportunity to have the same orientation and level of training as the actual end users would have received.

Recruited participants completed a pre-test questionnaire (see Appendix 5.9) which identifies the various professional backgrounds and demographic. The following is a table of Users identifying characteristics, including demographics, professional experience, EHR experience, Product Experience (Application being tested) and user needs for assistive technology. Participant names were replaced with User IDs so that an individual's data remains anonymous.

USER ID	Gender	Age	Education	Occupation	Professional Experience (months)	Computer Experience (months)	Product Experience (months)	Assistive Technology Needs
USER 1	F	30-39	Bachelor's Degree	Compliance/ Quality Coordinator	84	216	0	None
User 2	F	20-29	Associates Degree	Medical Records Supervisor	3	108	0	None
User 3	F	30 - 39	High School	Whole Person Care Associate Director	2	150	0	None
User 4	F	20 - 29	Bachelor's Degree	Medical Assistant	24	130	0	None
User 5	F	40-49	Postgraduate (MD/PhD)	Physician / Family Medicine Director	12	240	0	None
User 6	F	20-29	Some College	Digital Communication Supervisor	24	132	0	None
User 7	F	20-29	Current BSN student	Patient Experience Service Specialist	18	96	0	None
User 8	F	20 - 29	Postgraduate (MD/PhD)	Physician Assistant	7	168	0	None
User 9	F	20 - 29	High School Graduate	Patient Eligibility Specialist	12	65	0	None

User 10	F	60-69	Grad Student	Chief Administrative Officer	72	216	0	None

Table 1. Participant Demographics

11 participants were recruited, 10 Primary participants and 1 alternate, and 10 participated in the testing. One participant had to withdraw and was replaced with the alternate. Participants were scheduled for 30 to 45 minute sessions which included a debrief by the administrator. A spreadsheet was used to keep track of the schedule and record each participant's demographic characteristics.

3.3 STUDY DESIGN

The objective of the test was to identify where the application performed effectively, efficiently, and with satisfaction – and areas where the application failed to meet the needs or expectations of the participants. 2 Users with no or very limited experience with EHR's were specifically selected for testing as the observations made and data collected will help identify the training requirements when transitioning to the new EHR. It was decided that selecting Users with high levels of experience would not provide the results that would be returned by the average User which, is the goal of the study. The data from this test will serve as a baseline for possible future tests with an updated version of the same EHR using the same testing and data collection process. This test will be the benchmark to determine current usability and be used to identify where improvements in function and User satisfaction can be made and will be a key factor in the development of product training and User Manuals.

During the usability test, participants interacted with CHN Tech Solutions proctors and each participant 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
- 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 Usability Metrics.

3.4 TASKS

A series of tasks were developed that are realistic and representative of the activities a user might do with this EHR. Tasks were selected to ensure that there were variations in the processes the Users were tested on to help determine the intuitiveness of the application and ease in navigation. Additionally, they were selected to identify areas that are troublesome for Users to access and/or complete. These tasks, stemming from § 170.315(g)(3) Safety Enhanced Design, include:

1. Enter and Modify Demographics / Clinical Decision Support
 - 1.1 § 170.315 (a)(5) Demographics
 - 1.2 § 170.315 (a)(9) Clinical Decision Support
2. Add an implantable device
 - 2.1 § 170.315 (a)(14) Implantable Device List
3. Order a lab
 - 3.1 § 170.315 (a)(2) Computerized Provider Order Entry - laboratory

3.5 PROCEDURE

Upon connecting to the online meeting platform, participants were greeted; their identity was verified and matched with a name on the participant schedule. Participants were then assigned a participant ID, User 1 through User 10. Each participant signed an informed consent and release form (See Appendix 5.2 and 5.3).

One usability testing members participated in this test, the Usability Administrator, referred to in the testing process as the “Proctor”. The session was recorded and reviewed by the Proctor upon completion of the testing process ensure accuracy in documenting the Users actions and to verify completion times. The staff (Proctors) conducting the test were usability practitioners from CHN Tech Solutions LLC.

The Proctor 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. The Proctor also took notes on task success, path deviations, number and type of errors, and comments into a spreadsheet. Participants were instructed to perform the tasks:

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

For each task, the participants were sent the task prompt through email. Task timing began once the Proctor finished reading the task. The task time was stopped once the participant indicated they had

successfully completed the task. The scores are discussed in the Data Scoring section below. Following the session, the administrator emailed the participant the post-test questionnaire (see Appendix 5.10), and thanked each individual for their participation. The screen recordings were then reviewed by an Administrator who populated a secondary spreadsheet and verified start and end times, documented each User and test separately, identifying deviations, errors and verbalizations from the User and Proctor. Deviations, verbalizations and errors were assigned a number which was used to calculate the success of each task across the test group.

3.6 TEST LOCATION

The testing was conducted via a virtual online meeting platform. Participants used their personal or company provided computers for the testing. A link to the scheduled testing was provided to the participant. The participant's screen and audio were recorded.

3.7 TEST ENVIRONMENT

The EHR would be normally used in a healthcare office or facility but for evaluation the testing was conducted remotely and the participant used their own computer, keyboard and mouse to interact with the EHR. Participants were instructed not to change any of the default system settings (such as font size). The testing environment was set up by CHN Tech Solutions according to the documentation describing system set-up and preparation, and used a test database accessed via wireless connection. The system performance (i.e., response time) was representative to what actual users would experience in a normal use and differences in response times were noted as would be normal based on variations in connection speeds.

3.8 TEST FORMS AND TOOLS

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

- Moderator's Guide (Appendix 5.4)
- Pre-test questionnaire (Appendix 5.9)
- Post-test questionnaire (Appendix 5.10)
- System Usability Scale Questionnaire (Appendix 5.11)

These documents can be found in the Appendices referenced above. The Moderator's Guide was created to ensure a standardize method of grading and capturing data was used by each individual Proctor when evaluating Users. The questionnaires were stored locally and distributed to the Users through email by the Proctor doing their evaluation. The participant's interaction with the EHRUT was captured and recorded with screen capture software on the Proctors computer and verbal comments were recorded



with a microphone. Upon completion of the testing, the screen recordings were reviewed by a Review Administrator and each User and each test was reviewed. Start and stop times were verified for each task. The Users variations, errors and vocalizations were documented in a separate spreadsheet and assigned a number for use in evaluating User performance and success rates.

3.9 PARTICIPANT INSTRUCTIONS

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

Our session today will last for 40-60 minutes. During training you were provided instructions for logging in, but as a reminder, this info will be provided again in the Chat box if you need it. We are recording the audio and screen of our session today.

I will ask you to complete a few tasks using this system and answer some questions afterward. You will be asked to complete these tasks on your own, as quickly as possible. If you have difficulty, I am not able to instruct or provide help with anything to do with the system itself. I would like to request that you not talk aloud or verbalize while you are doing the tasks. 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. 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.

The product you will be using today is Integrated Care EHR. Please log into the testing environment.

Following the procedural instructions, participants were instructed to log-in to the usability testing environment of Integrated Care EHR. After logging in, the administrator gave the following instructions:

After presenting the task, I will say “Begin”. At that point, please complete the task and note out loud once you are done.

Do you have any questions or concerns?

Participants were then given four tasks to complete. Tasks are listed in the moderator’s guide in Appendix 5.4.

3.10 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:

- Effectiveness of Integrated Care EHR measuring participant success rates and errors.
- Efficiency of Integrated Care EHR by measuring the average task time and path deviations.
- Satisfaction with Integrated Care EHR by measuring ease of use ratings.

3.11 DATA SCORING

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

Measures	Rationale and Scoring
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Effectiveness: Task Success	<p>A task was counted as a “Success” if the participant was able to achieve the correct outcome, without assistance, within the time allotted on a per task basis.</p> <p>The total number of successes were calculated for each task and then divided by the total number of times that task was attempted. The results are provided as a percentage.</p> <p>Task times were recorded for successes. Observed task times divided by the optimal time for each task is a measure of optimal efficiency.</p> <p>Optimal task performance time, as benchmarked by expert performance under realistic conditions, is recorded when constructing tasks. Target task times used for task times in the Moderator’s Guide must be operationally defined by taking multiple measures of optimal performance and multiplying by some factor [e.g., 1.25] that allows some time buffer because the participants are presumably not trained to expert performance. Thus, if expert, optimal performance on a task was [65 seconds] then allotted task time performance was $[65 * 1.25 = 81 \text{ seconds}]$. This ratio should be aggregated across tasks and reported with mean and variance scores.</p>
Effectiveness: Task Failures	<p>If the participant abandoned the task, did not reach the correct answer or performed it incorrectly, or reached the end of the allotted time before successful completion, the task was counted as a “Failure”. No task times were taken for errors.</p> <p>The total number of errors was calculated for each task and then divided by the total number of times that task was attempted. Not all deviations would be counted as errors.¹¹ This should also be expressed as the mean number of failed tasks per participant.</p> <p>On a qualitative level, an enumeration of errors and error types should be collected.</p>
Efficiency: Task Deviations	<p>The participant’s path (i.e., steps) through the application was recorded. Deviations occur if the participant, for example, went to a wrong screen, clicked on an incorrect menu item, followed an incorrect link, or interacted incorrectly with an on-screen control. This path was compared to the optimal path. The number of steps in the observed path is divided by the number of optimal steps to provide a ratio of path deviation.</p> <p>It is strongly recommended that task deviations be reported. Optimal paths (i.e., procedural steps) should be recorded when constructing tasks.</p>
Efficiency: Task Time	<p>Each task was timed from when the administrator said “Begin” until the participant said, “Done.” If he or she failed to say “Done,” the time was stopped when the participant stopped performing the task. Only task times for tasks that were successfully completed were included in the average task time analysis. Average time per task was calculated for each task. Variance measures (standard deviation and standard error) were also calculated.</p>

Satisfaction: Task Rating	<p>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.</p> <p>Common convention is that average ratings for systems judged easy to use should be 3.3 or above.</p> <p>To measure participants' confidence in and likability of Integrated Care EHR 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.</p>
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Table 2. Details of how observed data were scored.

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. The usability testing results for the EHRUT are detailed below (see Table 3). The results should be seen in light of the objectives and goals outlined in Section 3.2 Study Design.

Measure	N	Task Success	Path Deviation	Task Time		Errors	Task Ratings 5+Easy
	#	Mean (SD)	Deviations (Observed / Optimal)	Mean (SD) seconds	Deviations (Observed / Optimal)	Mean (SD)	Mean (SD)
1.1 Enter and Modify Demographics	10	90 (10)	1/10	83 (28)	83/108	30 (.6)	5 (0)
1.2 Clinical Decision Support (CDS)	10	100(0)	0/8	99 (57)	99/108	10(.3)	5 (0)
2. Add an Implantable Device	10	80(40)	8/4	120(123)	120/80	30(.46)	4.2(.75)
3. Order a Lab	10	90 (10)	5/10	83 (29)	83/107	1.4 (3.6)	4.2 (.75)

Table 3: Performance Data

4.2 DISCUSSION OF THE FINDINGS

4.2.1 EFFECTIVENESS

The Users were able to complete all tasks with a 95% success rate, but there were significant variations in ease and completion times. The data collected identified a difference in ease of use based on prior experience and current job positions. The results are extremely beneficial in identifying future training requirements on the application based on the role of the User.

4.2.2 EFFICIENCY

The majority of the tasks were completed within the allocated time, although the “average” time of completion for the tasks fell outside of those times. A number of the Users had little or no previous experience with EHRs and their times drastically exceeded the allocated times but the information returned from these User’s is the information most beneficial in identifying the things that others will be most likely to struggle with. This information is key to modifying future versions and in the development of future training and user manuals.

Each task was benchmarked at 108, 80, 100 and 107 seconds, respectively. These numbers were calculated by recording the completion time for each task by Users who have experience using the system and calculating the average, then multiplying by 1.33, to provide a realistic benchmark for new Users.

Enter and Modify Demographics returned the best completion time, 99 seconds, which was under the adjusted optimal time, and also had the fewest deviations and errors with 4. “Enter Family History” returned the most errors, with 18, but this was a direct result of errors returned from the Users with limited or no experience. All other Users had very little difficulty completing the task. “Order a Lab” returned the longest average completion time with 186 seconds. The average completion time was a result of the extended time that it took the Users with limited or no experience to complete the task, although more experienced Users also took longer to complete this task as well.

Observations of the Users performing the task showed that even the Users with limited or no experience adapted very quickly to each task that they were exposed to and without a doubt would be able to perform each task again in the future effectively and efficiently.

4.2.3 SATISFACTION

Participants rated the tasks on the level of ease based on a five point Likert scale, with 1 being difficult and 5 being easy. Satisfaction ratings averaged to 4 or higher which indicates that users did not perceive the tasks as difficult. The results from the System Usability Scale scored the subjective satisfaction with the system on task performance to be 100%. All Users expressed satisfaction with the system and expressed that they would be pleased to use the system in the future. Additionally, all Users stated that they would recommend the system others. This highlights that the overall satisfaction of system usability can be improved upon, even when each task is perceived as easy.

4.2.4 MAJOR FINDINGS

The major finding from the observations and data returned was that benefits that would be seen through additional, focused training. It was observed that all Users, regardless of previous experience, clearly understood the tasks as they were being exposed to them and that they gained confidence very quickly in the limited time it took to complete the tasks. Providing this exposure through additional training prior to a User being exposed to the system would enhance the Users initial use of the system and would increase User confidence and efficiency.

This was the first tab based EHR that the Users were exposed to and at the beginning of the testing process there were signs of uncertainty in this function but it became apparent very quickly that once they did become familiar, it was a function that was very well received. Users made comments upon completion of the testing on the benefits of having the tab system and how it would make current tasks more efficient and much easier.

4.2.5 AREAS FOR IMPROVEMENT

User comments returned at the completion of the testing were almost all positive. One User stated that using an alternate font and color would make it easier to read, but this function is already available and can be adjusted in the User settings. Additional User training and familiarization will fix this issue. An additional comment for areas needing improvement was that the process for entering data into text fields seemed excessive. The User did not seem to realize that “copy & paste” was an existing option and the Users issue can be corrected with training. It was also suggested that relocating some functions and modifying grouping could be beneficial and increase intuitiveness and efficiency. These types of suggestions are the kind that will be brought in group meetings and a determination made.

5 APPENDICES

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

- 5.1 Participant Demographics
- 5.2 Non-Disclosure Agreement (NDA)
- 5.3 Informed Consent
- 5.4
 - 1. Example Moderator's Guide
 - i. Orientation
 - ii. Tasks
 - iii. Pre-Test Questionnaire
 - iv. Post-Test Questionnaire
 - 2. System Usability Scale Questionnaire

Appendix 5.1

PARTICIPANT DEMOGRAPHICS

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

Gender	Count
Men	0
Women	10
Other	0

Occupation	Count
Digital Communication Supervisor	1
Physician Assistant	1
Physician	1
Medical Assistant	1
Admin Staff	5

Years of Experience	Years
EHR Use	0-9 years – 6 participants 10- 19 years – 4 participants 20+ years – 0 participant

Appendix 5.2

NON-DISCLOSURE AGREEMENT

Non-Disclosure Agreement

THIS AGREEMENT is entered into as of _____, 2022, between
_____ (Participant) and the testing organization, CHN Tech Solutions LLC.

The Participant acknowledges his or her voluntary participation in today's usability study may bring the Participant into possession of Confidential Information. The term "Confidential Information" means all technical and commercial information of a proprietary or confidential nature which is disclosed by CHN Tech Solutions, LLC, or otherwise acquired by the Participant, in the course of today's study.

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

Any information the Participant acquires relating to this product during this study is confidential and proprietary to CHN Tech Solutions, LLC and is being disclosed solely for the purposes of the Participant's participation in today's usability study. By signing this form the Participant acknowledges that she or he will not receive monetary compensation for feedback and will not disclose this confidential information obtained today to anyone else or any other organizations.

Participant's printed name: _____

Signature: _____ **Date:** _____

Appendix 5.3:

Informed Consent

CHN Tech Solutions LLC 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.

Agreement

I understand and agree that as a voluntary participant in the present study conducted by CHN Tech Solutions LLC, I am free to withdraw consent or discontinue participation at any time. I understand and agree to participate in the study conducted and videotaped by the CHN Tech Solutions LLC

I understand and consent to the use and release of the videotape by CHN Tech Solutions LLC *Program*. I understand that the information and videotape is for research purposes only and that my name and image will not be used for any purpose other than research. I relinquish any rights to the videotape and understand the videotape may be copied and used 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 CHN Tech Solutions LLC *and its* client. 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:** _____

Appendix 5.4:

PROCTOR'S GUIDE

Orientation

Thank you for participating in this study.

Can I verify that you took the pre-test survey?

Our session today will last for 30-45 minutes. During training you were provided instructions for logging in, but as a reminder, this info will be provided again in the Chat box if you need it. We are recording the audio and screen of our session today.

I will ask you to complete a few tasks using this system and answer some questions. You will be asked to complete these tasks on your own, as quickly as possible. If you have difficulty, I am not able to instruct or provide help with anything to do with the system itself. I would like to request that you not talk aloud or verbalize while you are doing the tasks. 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. 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.

The product you will be using today is the Integrated Care EHR. Please log into the testing environment. Some of the data may not make sense as it is placeholder data.

After presenting the task, I will say "Begin". At that point, please complete the task and note out loud once you are done.

Do you have any questions or concerns?

Appendix 5.5.1

Task 1.1 & Task 1.2 Enter Patient Demographics/ Clinical Decision Support; User Instructions

SED Testing; Enter Patient Demographics / Clinical Decision Support Tester Instructions (Tasks 1.1 & 1.2)	
Date: _____	Proctor: _____
<p>Edit the following demographics for 'Allen One Test'.</p> <ul style="list-style-type: none"> ✓ 1. Gender Identity; choose 'Identifies as Male'. ✓ 2. Sexual Orientation; choose 'Straight or Heterosexual'. ✓ 3. DOB; change to '1975-12-12'. 	
<p>Post Task Evaluation</p> <p>On a scale of 1-5 with "1" being easy and "5" being difficult, how would you rate this task? _____</p>	
<p>Tester Comments:</p>	

Appendix 5.5.2

Task 1.2 & 1.2; Enter Patient Demographics/ Clinical Decision Support; Proctor Checklist

Note: Clinical Decision Support is verified in step 12 and is triggered by the change in D.O.B.

SED Testing; (a)(5) Enter Patient Demographics/ (a)(9) Clinical Decision Support Proctor Checklist (Task 1.1 & 1.2)							
Date: _____		Proctor: _____					
"Allen One Test" is a patient in the user's clinic. In this scenario, the user will modify this patient's demographics.							
Proctor Instruction s:	1.	Provide Instructions to Tester.					Complete: 108 Seconds. Actual Time to Complete: _____ Seconds.
	2.	Verify Tester understands instructions.					
	3.	Instruct the Tester to begin. (Start Timer).					
	4.	Observe Tester's progress. Make Notes as required.					
	5.	When task is complete, stop timer and document.					
	6.	Instruct Tester to complete post-test task evaluation and standby for the next task.					
	7.	Complete "Proctor Notes" as necessary.					
Instruction from Proctor to Tester:	Edit or Add the following demographics for "Allen One Test"						
	1.	Gender Identity; choose "Identifies as Male".					
	2.	Sexual Orientation; choose "Straight or Heterosexual".					
	3.	DOB; change to "1975-12-12".					
Provide Instructions to Tester and begin timer.							
Option #	"X" if Correct	Task	Step #	Screen or Window	Tester Action	Response	Observed Errors & Verbalizations
Option 1		(a)(5)	1	Calendar	Select "Patient" from Top Menu bar.	Drop down menu opens.	
		(a)(5)	2	Calendar	Select "New/Search" from the dropdown menu.	The "Search or Add Patient" window opens.	
		(a)(5)	3	Search or Add Patient	Enter search information for desired Patient and select "Search".	Pageup with a list of Patients that meet the search criteria opens.	
		(a)(5)	4	Patient Search Pageup	Select the desired Patient from the list.	The Patient Dashboard opens. GO TO Step #5.	
Option 2		(a)(5)	1	Calendar	Select "Finder" from the Top Menu bar.	The "Patient Finder" window opens.	
		(a)(5)	2	Patient Finder	Enter search information for desired Patient and select "Enter" on the keyboard.	A list of Patients that meets the search criteria is displayed.	
		(a)(5)	3	Patient Finder	Select the desired Patient from the list.	The Patient Dashboard opens. GO TO Step #5.	
Options 1 & 2		(a)(5)	5	Medical Record Summary	Select "Demographics".	The Patient Demographics tab is displayed.	
		(a)(5)	6	Medical Record Summary -> Demographics	Select the "edit" icon in the upper right corner of the Demographics tab.	The "Edit Current Patient" window opens.	
		(a)(5)	7	Edit Current Patient	Select the "Who" option.	The "Who" tab opens and displays Patient information.	
		(a)(5)	8	Edit Current Patient -> Patient	From the "Gender Identity" dropdown, select "Identifies as Male".	Patient Gender Identity is changed to "Identifies as Male".	
		(a)(5)	9	Edit Current Patient -> Patient	From the "Sexual Orientation" dropdown, select "Straight or Heterosexual".	Patient's Sexual Orientation is changed to "Straight or Heterosexual".	
		(a)(5) & (a)(9)	10	Edit Current Patient -> Patient	In the D.O.B. text box, change the D.O.B. to "1975-12-12".	Patient D.O.B. is changed to "1975-12-12".	
		(a)(5) & (a)(9)	11	Edit Current Patient -> Patient	Select "Save" in the upper left corner under "Edit Current Patient".	Task complete. Stop and Record Time.	
		(a)(9)	12	Medical Record Summary		Verify that The Clinical Reminders displays. (a)(9)	
		(a)(5)	13	Medical Record Summary		Verify entered information has been saved and is correct.	
Success: _____ _____ Easily Completed _____ Completed w/difficulty or help (describe) _____ Not completed.							
Proctor Notes / Comments:							

Appendix 5.6.1

Task 2; Add an Implantable Device; User Instructions

SED Testing; Add an Implantable Device Tester Instructions (Task 2)	
Date: _____	Proctor: _____
<p>Add an Implantable Device for "Allen One Test".</p> <ul style="list-style-type: none"> ✓ 1. Copy and paste the following UID. ✓ 2. {01}00889095205923{11}141231{17}150707{10}A213B1{21}1234 	
<p>Post Task Evaluation</p> <p>On a scale of 1-5 with "1" being easy and "5" being difficult, how would you rate this task? _____</p>	
Tester Comments:	

Appendix 5.6.2

Task 2; Add an Implantable Device; Proctor Checklist

SED Testing; Add an Implantable Device Proctor Checklist (Task 2)						
Date: _____		Proctor: _____				
Add an Implantable Device for "Allen One Test".						
Proctor Instruction s:	1.	Provide Instructions to Tester.				Complete: <u>80</u> Seconds. Actual Time to Complete: _____ Seconds.
	2.	Verify Tester understands instructions.				
	3.	Instruct the Tester to begin. (Start Timer).				
	4.	Observe Tester's progress. Make Notes as required.				
	5.	When task is complete, stop timer and document.				
	6.	Instruct Tester to complete post-test task evaluation and standby for the next task.				
	7.	Complete "Proctor Notes" as necessary.				
Instruction from Proctor to Tester:	Add an Implantable "Device for Allen One Test".					
	1.	Copy and paste the following UID:				
	2.	(01)00889095205923(11)141231(17)150707(10)A213B1(21)1234				
Provide Instructions to Tester and begin timer. Re-set screen to "Medical Record Dashboard" to begin task.						
Option #	"X" if Compl	Step #	Screen/Window or Popup	Tester Action	Response	Observed Errors & Verbalizations
Only 1 Option		1	Medical Record Summary	Select "Issues" from the horizontal menu.	"Medical Issues" screen opens.	
		2	Medical Issues	In "Medical Devices", select "+Add".	"Add/Edit" Issue popup opens.	
		3	Add/Edit Issue	Copies and pastes the UDI that has been provided into the UDI Text box and selects "Process UDI".	UDI information populates.	
		4	Add/Edit Issue	Scroll down to the bottom of the popup and select "Save".	Popup closes and screen returns to "Medical Issues".	
		5	Medical Issues	Tester verifies the Device has been added.	"Bone matrix implant, human derived" is added under "Medical Devices".	
		6	Patient Dashboard		Task complete. Stop and Record Time.	
		7	Patient Dashboard		Select "Demographics".	
					Verify entered information has been saved and is correct.	
Success: _____ Easily Complete _____ Completed w/difficulty or help (describe) _____ Not completed.						
Proctor Notes / Comments:						

Appendix 5.7.1

Task 3; Add Lab Order; User Instructions

SED Testing; Add a Lab Order Tester Instructions (Task 3)	
Date: _____	Proctor: _____
<p><u>Add Family History for "Allen One Test".</u></p> <ul style="list-style-type: none"> ✓ 1. Open existing Encounter "2022-08-30 Office Visit". ✓ 2. Add a Lab Order with the following details: ✓ Add "Clinical Diagnostic Code" for "Encntr for general adult medical exam w/o abnormal findings". ✓ 3. Add "Laboratory Test Code" for "Diabetes Test-->496-Hemoglobin A1c". ✓ 4. Collected and Ordered by "Medical Doctor" at the current Date and Time with a billing type of "Client Bill". 	
<p><u>Post Task Evaluation</u></p> <p>On a scale of 1-5 with "1" being easy and "5" being difficult, how would you rate this task? _____</p>	
Tester Comments:	

Appendix 5.7.2

Task 3; Add Lab Order; Proctor Checklist

SED Testing; Add a Lab Order; Proctor Checklist (Task 3)						
Date: _____		Proctor: _____				
Add a Lab Order for Allen One Test						
Proctor Instructions:	1.	Provide Instructions to Tester.				Complete: 107 Seconds. Actual Time to Complete: _____ Seconds.
	2.	Verify Tester understands instructions.				
	3.	Instruct the Tester to begin. (Start Timer).				
	4.	Observe Tester's progress. Make Notes as required.				
	5.	When task is complete, stop timer and document.				
	6.	Instruct Tester to complete post-test task evaluation and standby for the next task.				
	7.	Complete "Proctor Notes" as necessary.				
Instruction from Proctor to Tester:	Open an existing Encounter and add a Lab Order for Johnny Quest Test					
	1.	Open existing Encounter "2022-08-30 Office Visit".				
	2.	Add a Lab Order with the following details:				
	3.	Add "Clinical Diagnostic Code" for "Encntr for general adult medical exam w/o abnormal findings".				
	4.	Add "Laboratory Test Code" for "Diabetes Test-->496-Hemoglobin A1c".				
5.	Collected and Ordered by "Medical Doctor" at the current Date and Time with a billing type of "Client Bill".					
Provide Instructions to Tester and begin timer. Re-set screen to "Medical Record Dashboard" to begin task.						
Option #	"X" if Correct	Step #	Screen/Window or Pop-up	Tester Action	Response	Observed Errors & Verbalizations
Only 1 Option		1	Medical Record Summary	Select Encounter "2022-08-30 Office Visit" from the "Select Encounter" Drop-down menu.	Encounter "2022-08-30 Office Visit" opens.	
		2	2022-08-30 Encounter Summary	Select "Laboratory Orders" from the "Clinical" drop-down menu.	The "Laboratory Order" sub-option opens.	
		3	Laboratory Orders	Enter a variation of "Encntr for general adult medical exam w/o abnormal findings" in the Clinical Diagnostic Code search box and select "Search".	Code "Z00.00" is displayed.	
		4	Laboratory Orders	Select the checkbox next to "Z00.00" and then select "Add selected".	Diagnostic "Z00.00" is added to the Lab Order.	
		5	Laboratory Orders	Under "Laboratory Test Codes", select "Diabetes".	Diabetes Test Codes are displayed.	
		6	Laboratory Orders	Select the checkbox next to Code "496 Hemoglobin A1c" then select "Add selected".	The "Hemoglobin A1c" test is added to the Lab Order.	
		7	Laboratory Orders	In the "Collected By:" drop-down menu, select "Medical Doctor".	"Medical Doctor" is selected.	
		8	Laboratory Orders	In the "Collection Date" text box, select the current date.	Current date is selected.	
		9	Laboratory Orders	In the "Collection Time" text box, enter the current time.	Current time is selected.	
		10	Laboratory Orders	Under "Order Submissions-->Ordering Provider", select "Medical Doctor".	"Medical Doctor" is displayed as "Ordering Provider".	
		11	Laboratory Orders	Under "Order Submissions-->Billing Type", select "Client Bill".	"Client Bill" is displayed.	
		12	Laboratory Orders	Select "Submit".	A pop-up opens displaying the Transmit Requestion details.	
		13	Transmit Requestion Pop-up	Select "Close".	Pop-up closes and re-opens to the Encounter.	
						Task complete. Stop and Record Time.
Success: _____ Easily Complete _____ Completed w/difficulty or help (describe) _____ Not completed.						
Proctor Notes / Comments: _____						

Appendix 5.8

Pre-Test Questionnaire

-
1. What is your name? (This will not be shared in the testing report)
 2. What is your gender? Male, Female, Other:
 3. Have you participated in a focus group or usability test in the past 6 months? Yes / No
 4. Do you, or does anyone in your home, work in marketing research, usability research, or web design?
Yes / No
 5. 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
 6. What is your age (in years)?
0-19
20-29
30-39
40-49
50-59
60-69
70-79
80+
 7. Which of the following best describes your race or ethnic group?
Caucasian
Asian
Black/African-American
Latino/a or Hispanic
Other:
 8. Do you require any assistive technologies to use a computer?
 9. What is your current position?
RN
Physician
Resident
Administrative Staff
Other:
 10. What is your current title?
 11. How long have you held this position (in years)?
 12. What are some of your main responsibilities in this role?

13. What is your work location and environment?
Private practice health
system
Government
Clinic
Other:
14. Which of the following describes your highest level of education? high school
graduate/GED some college, college graduate (RN, BSN) postgraduate (MD/PhD)
Other:
15. In the last month, on how many days did you use 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?

Appendix 5.9

Post- Test Questionnaire

1. What is your name? (this will not be reported)
2. What was your overall impression of this system?
3. What aspects of the system did you like most?
4. What aspects of the system did you like least?
5. What aspects of the system did you like least?
6. Were there any features that you were surprised to see?
7. What features did you expect to encounter but did not see? That is, is there anything that is missing in this application?
8. Compare this system to other systems you have used.
9. Would you recommend this system to your colleagues?

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.¹⁶ 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).

Appendix 5.10

SYSTEM USABILITY SCALE QUESTIONNAIRE

User: _____

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

Strongly Disagree 1__ 2__ 3__ 4__ 5__ Strongly Agree

2. I found the system unnecessarily complex.

Strongly Disagree 1__ 2__ 3__ 4__ 5__ Strongly Agree

3. I thought the system was easy to use.

Strongly Disagree 1__ 2__ 3__ 4__ 5__ Strongly Agree

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

Strongly Disagree 1__ 2__ 3__ 4__ 5__ Strongly Agree

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

Strongly Disagree 1__ 2__ 3__ 4__ 5__ Strongly Agree

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

Strongly Disagree 1__ 2__ 3__ 4__ 5__ Strongly Agree

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

Strongly Disagree 1__ 2__ 3__ 4__ 5__ Strongly Agree

8. I found the system very cumbersome to use.

Strongly Disagree 1__ 2__ 3__ 4__ 5__ Strongly Agree

9. **I felt very confident using the system.**

Strongly Disagree 1__ 2__ 3__ 4__ 5__ Strongly Agree

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

Strongly Disagree 1__ 2__ 3__ 4__ 5__ Strongly Agree

