



**Safety-Enhanced Design
Usability Report**

ethizo

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EHR Usability Test Report of Ethizo EHR v2.0

Report Based on NISTIR 7742 Common Industry Format

Document Information

Date of Usability Test	October 21, 2024 - October 29, 2024
Date of Report	November 04, 2024
Report Prepared By	DocToMe, Inc. 33rd Ave CT NW, Suite 518,Gig Harbor, WA 98335.

1. Executive Summary

A usability test for Ethizo EHR v2.0 was conducted between October 21 and October 29, 2024. The objective of the study was to evaluate the usability of the current user interface and gather evidence regarding the decision support intervention (DSI) functionality within the EHR system. The test involved 15 active physicians and administrative staff, who matched the target demographic criteria, using Ethizo EHR v2.0 to perform tasks related to decision support interventions.

The study evaluated user performance in four key scenarios within the EHR:

- Add Clinical Decision Support Intervention
- Admin User Selects Evidence-based DSI and Access / Record / Change Source Attributes
- User Triggers Evidence-based DSI and Provides User Feedback
- Admin User Exports User Feedback

Each 30-minute one-on-one usability session was conducted remotely. Participants were greeted by the test administrator, informed of their right to withdraw at any time, and provided verbal consent for both participation and recording. The administrator introduced the test, explained the decision support functionality, and instructed participants to complete a series of tasks in a step-by-step manner using the EHR. Metrics such as task completion time and number of clicks were captured from session recordings after all sessions concluded. The administrator provided basic instructions but did not guide participants on how to complete tasks unless they were unsure how to proceed.

The following data was collected for each participant:

All participant data was anonymized to ensure privacy, with no identifiable information linked to the collected data. After the test, participants completed a post-test questionnaire. The usability evaluation followed recommended metrics from the NISTIR 7741 *Guide to the Processes Approach for Improving the Usability of Electronic Health Records*. Below is a summary of the performance and user satisfaction data gathered during the study.

Industry Standard Used

- **Name:** NISTIR 7741
- **Description:** NISTIR 7741 provides guidelines to improve product usability through a process-oriented approach. This standard focuses on enhancing user experience, minimizing user error, and increasing efficiency and satisfaction by establishing clear usability processes.
- **Citation:** National Institute of Standards and Technology. (2010). *NIST Guide to the Processes Approach for Improving the Usability of Electronic Health Records (NISTIR 7741)*.

Measure	N	Task Success	Path Deviation	Task Time (Seconds)		Errors	Task Ratings (5=Easy)
Task	#	Mean	Deviations (Observed)	Mean	Deviations (Observed)	Mean	Mean
		SD	/ (Optimal)	(SD)	/ (Optimal)	SD	SD
Add Clinical Decision Support Intervention	10	100% (0%)	10 / 9	78 (3)	11 / 8	0% (0%)	5.0 (0.0)
Admin User Selects Evidence-based DSI and Access / Record / Change Source Attributes	10	100% (0%)	11 / 11	62 (4)	14 / 6	0% (0%)	5.0 (0.0)
User Triggers Evidence-based DSI and Provides User Feedback	10	90% (30%)	8 / 7	38 (5)	7 / 4	10% (30%)	4.8 (0.35)
Admin User Exports User Feedback	10	100% (0%)	6 / 5	15 (3)	5 / 2	0% (0%)	5.0 (0.0)

System Usability Score

The System Usability Scale (SUS) was used to measure users' subjective satisfaction with the system based on their task performance. The system received a score of 86.53

In addition to the performance metrics, several qualitative observations were noted:

Major Findings

Participants found Ethizo EHR v2.0 highly effective and user-friendly, supporting efficient workflows and easy access to essential functions. Positive responses centered on the following areas:

- **DSI Accessibility:** Participants could view and access DSIs with ease and appreciated the system's organization in supporting decision-making.
- **Feedback Functionality:** Many participants noted the ease of providing feedback on DSIs and highlighted the system's capacity to capture user insights as valuable.
- **Intuitive Navigation:** Users described the navigation as intuitive, especially for tasks involving admin actions and DSI management.
- **Responsive Interface:** The interface's responsiveness and clear prompts allowed participants to complete tasks confidently and accurately.

Areas for Improvement

Participants provided constructive feedback with suggestions that reflect their positive experience and insights into further optimization:

- **Enhanced Click Efficiency:** While users appreciated the design, some suggested further reducing the number of clicks required for frequent actions, which could improve workflow efficiency.
- **Increased Icon Visibility:** While the interface was intuitive overall, a few participants suggested enhancing the visibility of source attributes icon to improve accessibility further.

2. Introduction

This study presents the usability testing conducted for Ethizo EHR v2.0, designed to provide healthcare professionals with a computerized system for recording and tracking patient health records. Ethizo EHR v2.0 supports various healthcare roles, including nurses, medical assistants, and physicians, across different healthcare settings.

The aim of this study was to evaluate and validate the usability of the user interface and demonstrate adherence to user-centered design principles, supporting certification for functionality outlined in §170.315(g)(3) Safety Enhanced Design and §170.315(b)(11) Decision Support Intervention (DSI).

The usability test simulated realistic tasks and conditions to evaluate the system's effectiveness, efficiency, and satisfaction. Key metrics such as task completion rates, time on task, path deviations, errors, post-task rating scores, and a System Usability Scale (SUS) score were collected during the testing.

3. Method

3.1. Participants

A total of 15 participants, including Physicians (MD/DO), nurse practitioners, RN Manager and physician assistants, were tested on the EHR system. Participants were selected by DocToMe Inc., and they had no direct connection to the development of the EHRUT. While the Participants were familiar with older versions of the EHRUT, this specific version was new to them and had some new features they had never experienced before. Participants received a brief training and orientation of new features prior to testing.

The recruited participants represented diverse backgrounds and demographics in alignment with the recruitment screener criteria. The table below summarizes participants' characteristics, covering demographics, professional experience, computing experience, and requirements for

assistive technology. Participant names were anonymized with unique Participant IDs to ensure data cannot be linked to specific individuals.

ID	Gender	Age	Education	Role	Professional Experience (Months)	Computer Experience (Months)	Product Experience (Months)	Assistive Technology Needs
P1	Male	40-49	Doctorate degree	Physician	180	198	36	No
P2	Female	40-49	Doctorate degree	Physician	240	204	21	No
P3	Female	30-39	Doctorate degree	Physician	120	186	35	No
P4	Male	30-39	Master's degree	Physician Assistant	66	210	24	No
P5	Male	40-49	Bachelor's degree	Registered Nurse	192	264	24	No
P6	Female	40-49	Doctorate degree	Physician	168	240	19	No
P7	Female	40-49	Doctorate degree	Physician	144	252	23	No
P8	Female	40-49	Bachelor's degree	Registered Nurse	204	282	36	No
P9	Male	50-59	Doctorate degree	Physician	300	312	20	No
P10	Female	40-49	Doctorate degree	Physician	156	216	19	No
P11	Male	50-59	Master's degree	RN Manager	288	252	23	No
P12	Female	50-59	Associate degree	Physician	312	240	9	No
P13	Female	40-49	Master's degree	Registered Nurse	180	192	24	No
P14	Male	60-69	Bachelor's degree	Registered Nurse	408	240	22	No
P15	Male	60-69	Bachelor's degree	Registered Nurse	372	216	20	No

3.2. Study Design

The primary goal of this test was to identify both the strengths and weaknesses of the application in terms of its effectiveness, efficiency, and user satisfaction. The data collected from this usability test may serve as a baseline for future testing with updated versions of the same EHR or for comparison with other EHR systems, provided the same tasks are used. This test serves as both a benchmarking tool for current usability and as a way to pinpoint areas where improvements are needed.

During the usability sessions, all participants interacted with the same version of the EHR under consistent conditions and were given identical instructions. The system was evaluated based on

three key criteria: effectiveness, efficiency, and user satisfaction. The following measures were collected and analysed for each participant:

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

3.3. Tasks

Four tasks were constructed that would be realistic and representative of the kinds of activities a clinical user might do with this EHR that also represented a functionality gap between what was already tested for criterion 170.315(a)(9) Clinical Decision Support and the new criterion 170.315(b)(11) Decision Support Intervention, including:

- Add Clinical Decision Support Intervention (Medium Risk)
- Admin User Selects Evidence-based DSI and Access / Record / Change Source Attributes (Low Risk)
- User Triggers Evidence-based DSI and Provides User Feedback (Low Risk)
- Admin User Exports User Feedback (Low Risk)

3.4. Procedures

All usability test sessions were conducted by an Ethizo EHR UX researcher with seven years of experience in administering usability tests. The remote testing took place via Zoom, which allowed for screen sharing, audio conferencing, and the ability to take mouse control of the participants' computers. Participants were instructed to choose a quiet location and use their own computers for the study.

At the start of each session, the UX researcher provided an introduction to the usability session and explained the following instructions to the participants:

- Complete tasks as quickly as possible without sacrificing accuracy (participants were not encouraged to think aloud).
- Save detailed comments until the end of the session.

Participants were also informed about the protection of their data (de-identification) and that the session would be recorded for analysis. Verbal consent was obtained from each participant before beginning the test. After providing demographic information, participants received a brief introduction to the functionality being tested.

The moderator then shared their screen displaying the EHR and granted control to the participants via Zoom. Task timing began once the moderator finished explaining the task and ended when the participant reached the designated goal screen. All test sessions were recorded using Zoom for subsequent analysis. These sessions were hosted through UserTesting.com, and the recordings were stored on an internal SharePoint page.

Since no additional researchers were present during the sessions, all key metrics—except for the System Usability Scale (SUS) survey—were collected from the session recordings. This data included task times, post-task ratings, participant comments, task success, path deviations, and the number and types of errors. After completing all tasks, participants were asked to fill out a SUS survey using Microsoft Forms. At the end of each session, participants were thanked for their time and feedback.

3.5. Test Location

Test sessions were held remotely via Zoom. The test administrator and participant logged into the session from their various locations.

3.6. Test Environment

The EHRUT would typically be used in a healthcare office or facility. In this session, the testing was conducted on Laptops running Windows 10 operating system. The participants used a mouse and keyboard when interacting with the EHRUT. The EHRUT used 15.5 inches' screen size and 1920x1080 resolutions. The application was set up by DocToMe, Inc. personnel according to the documentation describing the system set-up and preparation. The application itself was running on RedHat (Linux) server with demo database. Technically, the system performance (i.e., response time) was quite similar to what actual users would experience in a field implementation.

3.7. Test Form and Tools

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

1. Demographic Information Questionnaire
2. Participant Briefing and Debriefing Document
3. Usability Task Monitoring Document
4. Post-Test Survey (System Usability Scale)

Examples of these documents can be found in Appendices section

3.8. Participant Instructions

The administrator reviews the instructions provided. Participants received all necessary tasks to complete, which are detailed in the Usability Task Tracking document.

3.9. Usability Metrics

According to the NISTIR 7741 Guide to the Processes Approach for Improving the Usability of Electronic Health Records, EHR systems should facilitate a high level of usability for all users. The aim is for users to interact with the system effectively, efficiently, and with a satisfactory experience. To achieve this, metrics for effectiveness, efficiency, and user satisfaction were collected during the usability testing. The specific objectives of the test were to evaluate:

- **Effectiveness** of Ethizo EHR v2.0 by measuring participant success rates and errors
- **Efficiency** of Ethizo EHR v2.0 by assessing average task completion times and path deviations
- **Satisfaction** with Ethizo EHR v2.0 by collecting ease-of-use ratings from participants

3.10. Data Scoring

The following table details how tasks were scored, errors evaluated, and the time data analyzed and is taken directly from NISTIR 7742 Customized Common Industry Format Template for Electronic Health Record Usability Testing.

Measures	Rationale and Scoring
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. Optimal task performance time, as benchmarked by expert performance under realistic conditions, is recorded when constructing tasks.</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 an “Failures.” No task times were taken for errors.</p> <p>The total number of errors was calculated for each task and then divided by the total number of times that task was attempted. Not all deviations would be counted as errors. This should also be expressed as the mean number of failed tasks per participant.</p> <p>On a qualitative level, an enumeration of errors and error types should be collected.</p>

<p>Efficiency</p> <p>Task Deviation</p>	<p>The participant's path (i.e., steps) through the application was recorded. Deviations occur if the participant, for example, went to a wrong screen, clicked on an incorrect menu item, followed an incorrect link, or interacted incorrectly with an onscreen 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. It is strongly recommended that task deviations be reported. Optimal paths (i.e., procedural steps) should be recorded when constructing tasks.</p>
<p>Efficiency</p> <p>Task Time</p>	<p>Each task was timed from when the administrator said "Begin" until the participant said, "Done." If he or she failed to say "Done," the time was stopped when the participant stopped performing the task. Only task times for tasks that were successfully completed were included in the average task time analysis. Average time per task was calculated for each task. Variance measures (standard deviation and standard error) were also calculated.</p>
<p>Satisfaction</p> <p>Task Rating</p>	<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 likeability of the application 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."</p>

4. Results

4.1. Data Analysis and Reporting

The results of the usability tests were calculated according to the methods specified in the Usability Metrics section above. The usability testing results for Ethizo EHR v2.0 are detailed below. The results should be seen considering the objectives and goals outlined in the Study Design. The data should yield actionable results that, if corrected, yield a positive impact on user performance.

Measure	N	Task Success	Path Deviation	Task Time (Seconds)		Errors	Task Ratings (5=Easy)
Task	#	Mean	Deviations (Observed)	Mean	Deviations (Observed)	Mean	Mean
		SD	/ (Optimal)	(SD)	/ (Optimal)	SD	SD
Add Clinical Decision Support Intervention	10	100% (0%)	10 / 9	78 (3)	11 / 8	0% (0%)	5.0 (0.0)
Admin User Selects Evidence-based DSI and Access / Record / Change Source Attributes	10	100% (0%)	11 / 11	62 (4)	14 / 6	0% (0%)	5.0 (0.0)
User Triggers Evidence-based DSI and Provides User Feedback	10	90% (30%)	8 / 7	38 (5)	7 / 4	10% (30%)	4.8 (0.35)
Admin User Exports User Feedback	10	100% (0%)	6 / 5	15 (3)	5 / 2	0% (0%)	5.0 (0.0)

4.2. System Usability Scores

The System Usability Scale (SUS) was used to measure users' subjective satisfaction with the system based on their task performance. The system received a score of 86.53.

In addition to the performance metrics, several qualitative observations were noted.

Participant ID	Overall Task Rating - Scale Type	Task Rating
P1	System Usability Scale	75
P2	System Usability Scale	87
P3	System Usability Scale	76
P4	System Usability Scale	100
P5	System Usability Scale	80
P6	System Usability Scale	90
P7	System Usability Scale	80
P8	System Usability Scale	81
P9	System Usability Scale	85
P10	System Usability Scale	100
P11	System Usability Scale	85
P12	System Usability Scale	80
P13	System Usability Scale	100
P14	System Usability Scale	79
P15	System Usability Scale	100
Average		86.53

5. Discussion of Findings

Effectiveness

Analysis of success rates, failure incidences, and path deviations indicates that the system was well-designed and achieved high task performance scores.

Efficiency

Efficiency was assessed by comparing time on task to established benchmark times and measuring clicks per task against benchmark values. Most users completed tasks within or near the optimal time. A few participants experienced delays due to needing to switch between open browser tabs to input the correct information.

Satisfaction

Task ratings showed that all participants found the tasks intuitive and easy to perform. The System Usability Scale (SUS) score was 86.53, with a range from a low of 75 to a high of 100.

Major Findings

Participants rated the system highly, describing it as user-friendly, straightforward, and praised its simplicity. The opportunity to provide feedback on the DSI was a new concept for most and was well-received. Accessing user feedback as an administrative user was also found to be straightforward and efficient.

Areas for Improvement

Despite favorable results, some users noted that the system required more “clicking” than needed and suggested it could be further streamlined. Although the design was praised for being uncluttered, a few participants expressed the need for more visibility into source attributes viewing.

6. Appendices

Appendix 1: Informed Consent & Non-Disclosure Agreement

INFORMED CONSENT

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

AGREEMENT

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

I understand and consent to the use and release of recorded responses by DocToMe Inc. I understand that the information is for research purposes only and that my name and image will not be used for any purpose other than research.

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 DocToMe Inc. and DocToMe Inc.'s 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:

NON-DISCLOSURE AGREEMENT

Non-Disclosure Agreement THIS AGREEMENT is entered into as of October 21st, 2024, between (“the Participant”) and the testing organization DocToMe Inc. located at 33rd Ave CT NW, Suite 518, Gig Harbor, WA 98335.

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 DocToMe Inc., 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 DocToMe Inc. 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 s/he will receive monetary compensation for feedback and will not disclose this confidential information obtained today to anyone else or any other organizations.

Participant’s Name:

Signature:

Date:

Appendix 2: Demographic Questionnaire

Name	
Gender	
Age	
Education (highest attained)	
Clinical Role	
Professional Experience (in months)	
Experience with Computers in Healthcare (in months)	
Experience with EHR (in months)	

Appendix 3: Participant Briefing

Thank you for joining this study. Today's session will take around 30 minutes. During this time, you'll explore our EHR system and complete tasks aligned with ONC certification requirements. Our aim is to observe your task completion process to inform our efforts in certifying this product under the ONC Health IT Certification Program.

The product you'll be using is not yet finalized, but the features you'll interact with are close to their final state for the upcoming release. While we've set up clinical scenarios for testing, some of the test data may feel unrelated to your usual tasks and should be considered placeholder data.

I'll guide you through a few tasks using the system, after which I'll ask for your feedback. We're particularly interested in your experience with the system's ease of use, its potential utility for you, and any areas for improvement. Please complete each task independently, aiming to perform them as efficiently and accurately as possible. If you encounter any difficulties or get stuck, please try to continue without my assistance, as I won't be able to provide guidance on the system itself. Hold any detailed feedback until the end of each task or the session when we can discuss your observations freely. Honest feedback is essential to us as we work to improve the product.

This session will be recorded via web conferencing software, but all information you share will remain confidential, and your comments will not be linked to your identity.

Do you have any questions or concerns before we begin?

Appendix 4: Test Data and Flow

Task 1: Add Clinical Decision Support Intervention

Test Data Requirements:

1. **CDS Intervention Title:**
 - "High Blood Pressure Alert"
2. **Clinical Criteria:**
 - Patient's blood pressure (BP) \geq 140/90 mmHg
 - Patient age \geq 18 years
3. **Supporting Reference:**
 - National Heart, Lung, and Blood Institute (NHLBI) Guidelines
 - Publication: "Hypertension Guidelines 2020"
4. **Patient Population:**

- Adults aged 18 years and older

5. Intervention and Suggestion Description:

- "Alert the clinician when the patient's blood pressure is equal to or exceeds 140/90 mmHg, recommending that the patient be considered for hypertension management."
- Suggest medication review if patient is on antihypertensive therapy.
- Recommend lifestyle modification counselling.
- Prompt to order lab tests related to hypertension (e.g., cholesterol, glucose).

6. Expected Outcome:

- Clinical Decision Intervention is saved in the system

Task 2: Admin User Selects Evidence-Based DSI and Accesses/Records/Changes Source Attributes**Test Data Requirements:****1. Admin User Credentials:**

- **Username:** Enter Username
- **Password:** Enter Password
- **Role:** User role (with permissions to access, record, and modify DSIs and attributes)

2. DSI (Clinical Decision Support Intervention) Selection:

- **DSI Title:** "Diabetes Management Alert"
- **Evidence Source:** American Diabetes Association (ADA) Guidelines 2023

3. Source Attributes:

Attribute : Population Criteria

- **Current Value:** "Adults 18 years and older with a diagnosis of Type 2 diabetes"
- **New Value:** "All patients with Type 2 diabetes, regardless of age"

4. Access & Record Actions:

- **Action 1:** View and verify current DSI attributes.
- **Action 2:** Record initial values of the DSI attributes before making changes.
- **Action 3:** Document all modifications to source attributes in the system log.

5. Expected Changes & Verification:

- **Change Log Verification:** Confirm that all changes are recorded in the change log, with timestamps, previous values, and updated values.
- **Permissions Check:** Verify that only users with admin privileges can access and edit these attributes.

6. DSI Update Confirmation:

- **Update Status:** Verify that after changes are made, the DSI status is "Updated" and that

the system confirms successful changes.

Here's sample test data for **Task 3** in the **SED Document** testing, which involves a user triggering an evidence-based Clinical Decision Support Intervention (DSI) and providing feedback. This data helps ensure that the DSI responds correctly to user actions and that the feedback mechanism functions as expected.

Task 3: User Triggers Evidence-Based DSI and Provides User Feedback

Test Data Requirements:

1. User Credentials:

- **Username:** Enter Username
- **Password:** Enter Password
- **Role:** Physician (with permissions to view and respond to DSIs and submit feedback)

2. Clinical Decision Support Intervention (DSI) Details:

- **DSI Title:** "Diabetes Blood Sugar Control Alert"
- **Trigger Condition:** Blood glucose levels > 180 mg/dL for a patient diagnosed with diabetes
- **Suggested Action:** Review current medication and consider insulin adjustment or additional lifestyle counselling.

3. Patient Information (for triggering DSI):

- **Age:** 65 years
- **Diagnosis:** Type 2 Diabetes
- **Current Blood Glucose Level:** 195 mg/dL
- **Current Medications:** Metformin 500 mg, once daily

4. Expected DSI Trigger Event:

- **Scenario:** During a routine check-up, the clinician records the patient's latest blood glucose level (195 mg/dL).
- **System Response:** The DSI triggers an alert for the clinician recommending a review of the patient's diabetes management.

5. **User Feedback Data:**

- **Feedback Comment:** "The alert was helpful, but it could also include recent patient lab results for easier reference."
- "Include direct access to recent labs with a link."

6. **Feedback Submission Process:**

- **Action 1:** Clinician selects the feedback option within the DSI alert.
- **Action 2:** Clinician enters a comment and submits feedback.
- **Action 3:** System confirms that feedback was successfully submitted.

7. **Expected Outcome:**

- The system logs the feedback entry.
- The feedback is accessible to the system administrators for review.
- The user receives a confirmation message indicating that feedback was recorded.

Task 4: Admin User Exports User Feedback**Test Data Requirements:****1. Admin User Credentials:**

- **Username:** Enter Username
- **Password:** Enter Password
- **Role:** User role (permissions to view, manage, and export user feedback)

2. Expected Export Functionality:

- **Action 1:** Admin navigates to the user feedback section and selects “DSI Feedback Report.”
- **Action 2:** Admin applies filters for a specific date range and DSI.
- **Action 3:** CSV format and initiates the export.

3. Expected Outcome:

- The system generates a CSV file containing the filtered feedback records.
- The exported file includes all specified data fields in the correct format.
- The export completes successfully without errors.

Appendix 5: System Usability Scale Questionnaire

	Strongly disagree 1	2	3	4	Strongly agree 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 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					



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Usability Report**

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EHR Usability Test Report of ethizo EHR v2.0

Report Based on ISO/IEC 25062:2006 Common Industry Format

Document Information

Date of Usability Test	October 20, 2019 - October 31, 2019
Date of Report	December 20, 2019
Report Prepared By	DocToMe, Inc. 33rd Ave CT NW, Suite 518, Gig Harbor, WA 98335.

1. Executive Summary

Usability testing for selected features of ethizo EHR v2.0 was conducted in pursuance of Safety-Enhanced Design requirements outlined in §170.315(g)(3) criteria of the 2015 Edition Health IT Certification.

The purpose of this study was to test and validate the usability of current user interface and verify if requirements stated in the user-centered design processes have been applied to the EHR under Test (EHRUT), that includes following certification criteria:

- 170.315(a)(1): Computerized provider order entry--medications
- 170.315(a)(2): Computerized provider order entry--laboratory
- 170.315(a)(3): Computerized provider order entry--diagnostic imaging
- 170.315(a)(4): Drug-drug and drug-allergy interaction checks for CPOE
- 170.315(a)(5): Demographics
- 170.315(a)(6): Problem list
- 170.315(a)(7): Medication list
- 170.315(a)(8): Medication allergy list
- 170.315(a)(9): Clinical Decision Support
- 170.315(a)(14): Implantable devices

These tests were carried out between October 20, 2019 and October 31,2019. During the usability tests, a total of 15 healthcare personnel including physicians and administrative staff members matching the target demographic criteria served as participants and used ethizo EHR v2.0 in simulated, but representative tasks.

Study collected performance data for 11 tasks that are typically conducted on an EHR:

- Access, Record and Modify Lab Orders
- Access, Record and Modify Radiology Orders
- Access, Record and Modify Medication Orders
- Record, Review and Modify Medication Allergy List
- Record Medication Order and Review Drug - Drug Interaction & Drug - Allergy Interaction
- Record and Modify Demographics Information
- Access, Record and Modify Problems
- Add an Implantable Device
- Inactivate an Implantable Device
- Configure a Clinical Decision Support Rule
- Trigger a Clinical Decision Support Rule

During the 60 minutes online usability test, each participant was greeted by the administrator and asked to review and sign an informed consent and a non-disclosure document; they were also instructed that they could withdraw at any time. Most of the participants that were part of this activity had prior experience with the software. The administrator introduced the test, and instructed participants to complete a series of tasks (given one at a time) using the EHRUT. During the testing, the administrator timed the test and recorded user performance data electronically. The administrator did not give assistance to participants in how to complete the task.

Participant screens 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 to rate the tasks and entire application. None of the participants were compensated for their participation as they volunteered for this activity. 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.

The results from the System Usability Scale scored the subjective satisfaction with the system based on performance with these tasks to be: 85.87%. In addition to the performance data, the following qualitative observations were made.

Major findings

Most of the participants found ethizo EHR v2.0 to be user-friendly, and efficient. Furthermore, participants acknowledged that EHRUT's interfaces were intuitive and conducive for performing majority of the presented tasks. This resulted in a low task failure rate.

Areas for improvement

A couple of components were identified for which usability can be improved by making the workflows simpler with a few modifications.

2. Introduction

EHRUT tested for this study was ethizo EHR v2.0. Designed to present medical information to healthcare providers, electronic health record (EHR) software within the intended use of the product for specified workflows. The usability testing attempted to represent realistic exercises and conditions.

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

The aim of testing this product was to evaluate the system current interface, design and functionalities in accordance to NISTIR 7741 usability standard. The characteristics that were considered during this process were product efficiency, level of user satisfaction and degree of effectiveness of the system. We made a fair attempt to conduct the experiment so that results come out to be more realistic and valid.

3. Method

3.1. Participants

A Total of 15 Participants were tested on ethizo EHR v 2.0. Participants in the test were different Specialty healthcare providers. Participants were selected by DocToMe, Inc. and each participant volunteered for the test event. None of the participants were provided compensation for their time. 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.

Participants had a mix of backgrounds and demographic characteristics, representing the cohort of intended users. The following is a table of participants by characteristics, including demographics, professional experience, and computer experience. Participant names were replaced with Participant IDs, so that individuals' data cannot be tied back to individual identities.

ID	Gender	Age	Education	Occupation/Role	Professional Experience (Months)	Computer Experience (Months)	Product Experience (Months)	Assistive Technology Needs
U1	Male	30-39	College Graduate	Licensed Practice Nurse (LPN)	84	240	20	No
U2	Female	30-39	Post Graduate	Nurse	168	276	20	No
U3	Female	20-29	College Graduate	Licensed Practice Nurse (LPN)	60	144	1	No
U4	Female	30-39	College Graduate	Nurse	96	156	20	No
U5	Female	20-29	Some College	Medical Assistant (MA)	72	60	2	No
U6	Female	20-29	College Graduate	Medical Assistant (MA)	72	72	2	No
U7	Female	20-29	College Graduate	Other-Receptionist	36	84	37	No
U8	Female	20-29	College Graduate	Medical Assistant	48	72	37	No
U9	Female	20-29	College Graduate	Licensed Practical Nurse (LPN)	24	84	18	No
U10	Female	60-69	College Graduate	Nurse	180	240	18	No
U11	Female	30-39	College Graduate	Licensed Practical Nurse (LPN)	60	144	18	No
U12	Female	30-39	College Graduate	Medical Assistant	72	120	29	No
U13	Male	60-69	Post Graduate	Physician	240	252	20	No
U14	Female	50-59	College Graduate	Nurse	60	60	20	No
U15	Female	60-69	College Graduate	Medical Assistant (MA)	72	264	20	No

All the participants were present for the usability test. No participants failed to show up (during scheduled online session) for the study. Participants were scheduled for 1 session of 60 minute with time after the session for an overview 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.

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 the ethizo EHR v2.0. Each participant used the system at their 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 (Average)
- Participant's satisfaction ratings of the system.

3.3. Tasks

Multiple test patients, for e.g. "Wade Willson One" were created for this activity so that the tasks can easily be tracked and for better understanding of participants.

Task 1: Access, Record and Modify Lab Order

Access patient's Lab orders where a list will contain an order with the following lab test: '8898- CBC W/Diff, GLUC GEST 1HR'

Modify this order and replace with the following details:

Diet: Fasting
Collected at : Office

Add a new lab order with the details given below:

Laboratory: Quest Diagnostic
Ordering Provider: Jane Doe (will be auto selected)
Location: Patient's default (will be auto selected)
Date: Today's + current time (will be auto filled)
Bill to: Patient
Test: 3000 – CBC W/Differential, W/Platelet
Diet: Fasting
Collected at: Lab
Urgency: Stat

Task 2: Access, Record and Modify Radiology Order

Access patient's Radiology orders. List will contain an order with the following test.

ABD2CXR1 - ABDOMEN 2 VIEWS WITH PA CHEST

Modify this order and change the following details:

Diet: Fasting
Urgency: STAT

Patient's instructions: Do not eat anything for 6 hours before the test.

Now add new radiology order with following details:

Radiology Practice: Valley Radiology
Order Provider: Jane Doe
Location: should be auto selected (patient's default location)
Date: Today's + current time
Bill to: Patient
Test: CHEST1VIEW - CHEST 1 VIEW
Diet: Normal
Urgency: Normal

Task 3: Access, Record and Modify Medication Orders

Access patient's current medication which currently has "Lisinopril 30mg" displayed. Firstly, remove Lisinopril and mark it 'Completed' in the list. Secondly, prescribe a new medication order that has been detailed below:

Drug Name: Allopurinol
Strength: 300mg
Quantity: 4
Dosage Unit: Tablet
Route: By Mouth
Frequency: Daily
Days Supply: 4
Refill: 0

Once the order has been added, try to edit this order and change frequency from "Daily" to "BID". Press "Update Prescription" to execute it

Task 4: Record, Review and Modify Medication Allergy List

Record patient's known drug allergy with the following details:

Type: Drug Allergy
Allergy: Amoxicillin
Reaction: Shortness of breath/difficulty breathing
Severity: Unknown

Modify Amoxicillin Allergy and change following detail

Severity: Moderate
Onset Date: January 2016

Task 5: Record Medication Order and Review Drug - Drug Interaction & Drug - Allergy Interaction

Create a Prescription for Amoxicillin with details mentioned below:

Drug Name: Amoxicillin (oral - tablet)

Strength: 500 mg

Quantity: 4

Dosage Unit: Tablet

Route: By Mouth

Frequency: Daily

Days Supply: 4

Refill: 0

Now 'Drug – Allergy Interaction' and 'Drug – Drug Interaction' alerts will appear as a warning. Proceed with overriding the 'Drug – Drug Interaction' alert with the following reason, "Provider Approved" and click on "Approve & Print" to add Amoxicillin

Task 6: Record and Modify Demographics Information

Edit patient race, ethnicity, preferred language, sexual orientation and gender identity.

Add the following details to the respective fields:

Race: Black or African American

Ethnicity: Dominican

Preferred Language: English

Sexual Orientation: Choose not to disclose

Gender Identity: Male

Task 7: Access, Record and Modify Problems

Access patient's problem list. It will have "Headache" as one of the problems in the list. Modify "Headache" and change the following detail.

Status: Resolve

Now add a new problem in the patient's problem list with the following details.

Diagnosis: I10 - Essential (primary) hypertension

Name: Essential (Primary) Hypertension

Severity: Mild persistent.

Task 8: Add an Implantable Device

Need to add a signed procedure 33999 - Cardiac surgery procedure in patient record Add "(01)00643169007222(17)160128(21)BLC200461H" implantable device during cardiac surgery procedure.

Task 9: Inactivate an Implantable Device

Mark the implantable device with UDI

"(01)00643169007222(17)160128(21)BLC200461H" added in previous task as inactive from the list

Task 10: Configure a Clinical Decision Support Rule

Create a rule with the following information:

Title: Screening for High Blood Pressure

Valid From: 01/01/2019

Valid To: 31/12/2019

Frequency: 1 month

Demographics > Gender: Male

Problem > Code > I10 Essential (Primary) Hypertension

Medications > Code > 197361 - amlodipine 5 mg tablet

Intervention Type: Vitals

Intervention Text: Record Blood Pressure

Bibliographic Citation: Screening for hypertension annually compared with current practice: Annals of Family Medicine, 11 (2), 116-121.

Developer: Doctome Inc

Task 11: Triggering the configured CDS rule

Trigger the intervention by adding the following medication:

Drug Name: amlodipine (oral - tablet)

Strength: 5 mg Quantity: 1

Dosage Unit: Tablet

Route: By Mouth

Frequency: Daily

Dispense: 5

Days Supply: 5

Refill: 0

After prescribing the drug, navigate to the patient's profile, and review triggered intervention: Screening for High Blood Pressure.

- See if reference education material is available for sharing with the patient.
- View Source Attributes for the intervention
- Select the checkbox against "Record Blood Pressure" and save the alert by marking it as completed.

3.4. Procedure

Upon joining the remote session, 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 gave written consent on an informed consent form and signed non disclosure agreement (Appendix.1)

To ensure that the test ran smoothly, two staff members participated in this test, the usability administrator and the data logger. An 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, which were recorded into a spreadsheet.

Participants were instructed to perform the tasks (see specific instructions below):

- As quickly as possible while 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. Each session was recorded, and the administrator took notes on the participant's interaction with the system. During the session, the test questionnaire was administered, and participants' demographic information, task success rate, time on task, deviations, and errors were recorded into an excel form. Upon completing all the tasks, the administrator gave the participant the post-test questionnaire (e.g., the System Usability Scale). Participants were thanked for their time.

3.5. Test Location

Sessions conducted on October 20 – October 31, 2019 were remote sessions. The remote sessions were conducted via Zoom. Participants were instructed to call into an audio conference and login to a Zoom meeting. For these remote testing sessions, the moderator was at his personal office; the data logger documented the data from his personal office; and each participant was at his/her location. All sessions were audio and video recorded.

3.6. Test Environment

The EHRUT would typically be used in a healthcare office or facility. In this session, the testing was conducted on Laptops running Windows 10 operating system. The participants used a mouse and keyboard when interacting with the EHRUT. The EHRUT used 15.5 inches' screen size and 1920x1080 resolutions. The application was set up by DocToMe, Inc. personnel according to the documentation describing the system set-up and preparation. The application itself was running on RedHat (Linux) server with demo database. Technically, the system performance (i.e., response time) was representative of 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:

- Demographic Information Form
- Informed Consent & Non Disclosure Agreement
- Participant Instructions Sheet
- Post Test Questionnaire
- System Usability Scale Questionnaire
- Excel Spreadsheet (Data Logging)
- SLI SED checklist validator

3.8. Participant Instructions

The administrator read the following instructions aloud to each participant:

Thank you for participating in this study. Our session today will last 60 minutes. During that time, you will be performing tasks with ethizo EHR v2.0 in order to evaluate the extent to which the application is effective/not effective and efficient/not efficient in terms of Meaningful Use certification criteria

Your input is very important. During the time of the study, 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 to make 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.

Following the procedural instructions, participants were given in the task sheet to which contained the task name and summary and a post task questionnaire.

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:

- Effectiveness of ethizo EHR v2.0 by measuring participant success rates and errors.
- Efficiency of ethizo EHR v2.0 by measuring the average task time and path deviations.
- Satisfactions with ethizo EHR v2.0 by measuring ease of use ratings

3.10. Data Scoring

The quantitative information collected consisted of measurable results that we analyzed to determine how the test participants performed compared to established benchmarks. Some of the quantitative information we collected included time spent on task, the percentage of test participants succeeding or failing at tasks, and so on.

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

Measures	Rationale and Scoring
<p>Effectiveness: Task Success</p>	<p>A task was counted as a “Success” if the participant was able to achieve the correct outcome, without assistance, within the time allotted on a per task basis.</p> <p>The total number of successes were calculated for each task and then divided by the total number of times that task was attempted. The results are provided as a percentage.</p> <p>Task times were recorded for successes. Observed task times divided by the optimal time for each task is a measure of optimal efficiency.</p>

<p>Effectiveness: Task Failures</p>	<p>If the participant abandoned the task, did not reach the correct answer or performed it incorrectly, or reached the end of the allotted time before successful completion, the task was counted as an “Failures.” No task times were taken for errors.</p> <p>The total number of errors was calculated for each task and then divided by the total number of times that task was attempted. Not all deviations would be counted as errors. This should also be expressed as the mean number of failed tasks per participant.</p> <p>On a qualitative level, an enumeration of errors and error types should be collected.</p>
<p>Efficiency: Task Deviations</p>	<p>The participant’s path (i.e., steps) through the application was recorded. Deviations occur if the participant, for example, went to a wrong screen, clicked on an incorrect menu item, followed an incorrect link, or interact 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>
<p>Efficiency: Task Time</p>	<p>Each task was timed from when the administrator said, “Begin” until the participant said, “Done.” If he or she failed to say, “Done,” the time was stopped when the participant stopped performing the task. Only task times for tasks that were successfully completed were included in the average task time analysis. Average time per task was calculated for each task. Variance measures (standard deviation and standard error) were also calculated.</p>
<p>Satisfaction: Task Rating</p>	<p>Participant’s subjective impression of the ease of use of the application was measured by administering both a simple post-task questions 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>To measure participants’ confidence in and likeability of the ethizo EHR v2.0 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.”</p>

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 analysis.

The usability testing results for the EHRUT are detailed below.

Task	Number	Task Success	Path Deviation	Task Time		Errors	Task Ratings 5 = Very Easy
				Mean (SD)	Deviations (Observed / Optimal)	Mean	Mean
Access, Record and Modify Lab Orders	15	15 (100%)	1.14	127.47(111)	2.36	0	4.73
Access, Record and Modify Radiology Orders	15	15 (100%)	1.20	90.67(22)	0.46	0	4.87
Access, Record and Modify Medication Orders	15	14 (93.33%)	1.04	105(42)	0.46	1(6.67%)	4.60
Record, Review and Modify Medication Allergy List	15	15 (100%)	1.17	95.8(28)	0.53	0	4.87
Record Medication Order and Review Drug - Drug Interaction & Drug - Allergy Interaction	15	15 (100%)	0.98	101.07(33)	0.40	0	4.87
Record and Modify Demographics Information	15	15 (100%)	0.98	68.87(26)	0.52	0	4.87
Access, Record and Modify Problems	15	15 (100%)	1.25	72.47(31)	0.73	0	4.93
Add an Implantable Device	15	14 (93.33%)	1.03	76.6(50)	0.79	1(6.67%)	4.47

Inactivate an Implantable Device	15	15 (100%)	1.33	9.2(6)	1.28	0	4.87
Configure a Clinical Decision Support Rule	15	15 (100%)	0.99	388.07(129)	0.68	0	4.13
Trigger a Clinical Decision Support Rule	15	14 (93.33%)	1.00	192.6(141)	0.81	1(6.67%)	4.27

The results should be seen in light of the objectives and goals outlined in the Study Design section. The data should yield actionable results that, if corrected, yield material, positive impact on user performance.

4.2. Discussion of Findings

Task 1: Access, record and modify Lab Orders

In this task, participants were asked to create a lab order for a specific test and modify a test in a pending order.

Major Findings:

All the participants were able to complete this task. Some of them completed it in a very short time.

Areas for Improvement:

No major suggestions for improvement were given as they found this task easy and doable.

Task 2: Access, record and modify Radiology Orders

In this task, participants were asked to view current orders and create a radiology order.

Major Findings:

All the participants were able to complete this task. Some of them completed it in a very short time.

Areas for Improvement:

No major suggestions for improvement were given as they found this task easy and doable.

Task 3: Access, record and modify Medication Orders

In this task, participants were asked to assess a patient's current medication, add a new one and update an existing medication.

Major Findings:

All the participants were able to complete this task. Some of them completed it in a very short time.

Areas for Improvement:

No major suggestions other than the interface improvement were suggested.

Task 4: Record, Review and Modify Medication Allergy List

In this task, participants were instructed to add a medicine allergy to patient allergies list.

Major Findings:

All the participants were able to complete this task. Some of them completed it in a very short time.

Areas for Improvement:

No major suggestions for improvement were given, as adding allergies in the system is quite straightforward.

Task 5: Record Medication Order and Review Drug - Drug Interaction & Drug – Allergy Interaction

In this task, participants were instructed to create a medication order, view drug interaction alert and override the alert after entering specified comments.

Major findings:

Most of the participants were able to complete the task with ease as user sees a very clear notification of drug – drug interaction and cannot proceed without overriding the mandatory alert.

Areas for Improvement:

No major suggestions for improvement were given as they found this task easy and doable.

Task 6: Record and Modify Demographics Information

In this task, participants were instructed to add specified demographic information of the patient.

Major findings:

All the participants were able to complete this task, as it is quite straightforward in the application.

Areas for Improvement:

No major suggestions for improvement were given as they completed the task easily.

Task 7: Access, Record and Modify Problems

In this task, participants were instructed to add specified problem information of the patient.

Major findings:

All the participants were able to complete this task, as it is quite straightforward in the application.

Areas for Improvement:

No major suggestions for improvement were given as they completed the task easily.

Task 8: Add an Implantable Device

In this task, participants were asked to add a specific implantable device to patient record.

Major Findings:

The participants found this task easy and were able to complete it in time as they found the workflow easy.

Areas for Improvement:

Participants suggested to add an automated entry mechanism for UDI, for e.g. entering UDI via barcode reader..

Task 9: Inactivate an Implantable Device

In this task, participants were asked to inactivate an implantable device.

Major Findings:

All the participants were able to perform this task as only toggling a button can do this.

Areas for Improvement:

The participants suggested no improvement.

Task 10: Configure a Clinical Decision Support Rule

In this task, participants were instructed to view the previous CDS rules for a patient and create a CDS rule with specific information given.

Major Findings:

The participants found this module a bit technical to use because of its dynamic nature and spent relatively more time on it. But once they wrote a rule, they got comfortable and adding the rest of the rules became easy for them.

Areas for Improvement:

No major suggestions were given for improvement.

Task 11: Trigger a Clinical Decision Support Rule

In this task, participants were asked to review CDS alert for the patient and override the alert by adding specific comments

Major Findings:

The participants found this task easy but it took more time to enter all the data for the patients in different module to trigger one rule. Most of the participants were able to trigger rules successfully.

The participants found this task relatively easier than creating the CDS rule. Most of the participants were able to complete this task before time.

Areas for Improvement:

Participants were mainly stuck at the point where they were to take recommended action on CDS alert.

4.3. Overall Satisfaction Ratings

Overall, the EHRUT performed extremely well during this usability testing. Most tasks were performed efficiently and effectively with a high level of satisfaction reported by the participants. The results from the SUS (System Usability Scale) scored 85.87 with the subjective satisfaction of the system based on performance with these tasks.

Participant Identifier	Overall Task Rating - Scale Type	Task Rating
U1	System Usability Scale	100
U2	System Usability Scale	80
U3	System Usability Scale	100
U4	System Usability Scale	72
U5	System Usability Scale	100
U6	System Usability Scale	98
U7	System Usability Scale	76
U8	System Usability Scale	64
U9	System Usability Scale	96
U10	System Usability Scale	84
U11	System Usability Scale	74
U12	System Usability Scale	84
U13	System Usability Scale	96
U14	System Usability Scale	82
U15	System Usability Scale	82
Average		85.87

5. Appendices

5.1. Appendix 1 : Informed Consent & Non Disclosure Agreement

INFORMED CONSENT

DocToMe Inc. 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.

AGREEMENT

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

I understand and consent to the use and release of recorded responses by DocToMe Inc. I understand that the information is for research purposes only and that my name and image will not be used for any purpose other than research.

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 DocToMe Inc. and DocToMe Inc.'s 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:

NON-DISCLOSURE AGREEMENT

Non-Disclosure Agreement THIS AGREEMENT is entered into as of October 24th, 2019, between ("the Participant") and the testing organization DocToMe Inc. located at 33rd Ave CT NW, Suite 518, Gig Harbor, WA 98335.

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 DocToMe Inc., 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 DocToMe Inc. 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 s/he will receive monetary compensation for feedback and will not disclose this confidential information obtained today to anyone else or any other organizations.

Participant's Name:

Signature:

Date:

5.2. Appendix 2 : Demographic Information Form

DEMOGRAPHIC INFORMATION FORM

1. Name:
2. Credentials:
3. Highest Level of Education:
 - a. High school graduate/GED
 - b. Some college
 - c. College graduate
 - d. Postgraduate
 - e. Other (please specify): _____
4. Organization:
5. Primary Work Location:
6. Contact method (please provide one of the following):
 - a. Work phone:
 - b. Cell phone:
 - c. Email:
7. What is your gender?
 - a. Male
 - b. Female
 - c. Other (please specify): _____
8. Which of these best describes your current age?
 - a. <20
 - b. 20-29
 - c. 30-39

- d. d. 40-49
- e. 50-59
- f. 60-69
- g. 70-79
- h. ≥ 80

9. Is English your first language?

- a. Yes
- b. No

10. Are you a fluent English speaker? [if No, disqualify]

- a. Yes
- b. No

11. Due to logistical restraints and the parameters of this study, we cannot provide assistive technologies during the testing session. Do you require any assistive technologies to use a computer? [if Yes, disqualify]

- a. Yes
- b. No

12. Do you, or does anyone in your household, have a commercial interest in an electronic health record software or consulting company? [if Yes, disqualify]

- a. Yes
- b. No

13. How many years of experience do you have using computers for personal and professional activities (such as email, shopping, record keeping, etc.)?

- a. <5 years
- b. 5-10 years
- c. 10-20 years
- d. >20 years

14. What is your current role? [if not Nurse or Physician, disqualify]

- a. Analyst
- b. Application Coordinator
- c. Certified Nursing Assistant (CNA)
- d. CEO, CMIO, CIO, etc.
- e. Consultant
- f. Director
- g. Information Technology
- h. Licensed Practical Nurse (LPN)
- i. Marketing/Communications
- j. Medical Assistant (MA)
- k. Nurse
- l. Nurse Practitioner (NP)
- m. Office Manager
- n. Pharmacist
- o. Physician
- p. Physician Assistant (PA)
- q. Project Manager
- r. SVP, AVP, VP, etc.
- s. Trainer
- t. Other (please specify): _____

15. Do you currently provide direct patient care? [if No, disqualify]

- a. Yes
- b. No

16. In which setting do you primarily work? [if Ambulatory or Emergency Department, disqualify]

- a. Inpatient
- b. Emergency Department
- c. Ambulatory

17. What is your specialty? [if role is Physician and specialty is Radiology, Ophthalmology or Pathology, disqualify]

18. How many years have you been working in your field?

- a. <5 years
- b. 5-10 years
- c. 10-20 years
- d. >20 years

19. Have you participated in ethizo EHR usability testing previously?

- a. Yes
- b. No

If yes, please describe: _____

20. How do you capture patient data in your organization? [if Primarily on paper, disqualify]

- a. Primarily on paper
- b. Primarily electronically

5.3. Appendix 3 : 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)

SYSTEM USABILITY SCALE QUESTIONNAIRE

Strongly disagree

Strongly agree

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

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

2- I found the system unnecessarily complex.

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

3- I thought the system was easy to use.

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

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

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

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

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

6- I found the system unnecessarily complex.

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

7- I thought there was too much inconsistency in this system.

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

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

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

9- I felt very confident using the system.

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

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

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