CarbyOs EHR version 3.0 Usability Test Report

August 28, 2025

Safety Enhanced Design

EHR Usability Test Report of CarbyOs EHR version 3

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

CarbyOs EHR

Date of Usability Test:	November 01 2024 – August 15, 2025
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1.EXECUTIVE SUMMARY

A usability test for CarbyOs EHR version 3, an open-source electronic health record designed for patient care management, was conducted virtually between November 01, 2024, and August 15, 2025, by Carbon Health Technology. The primary goal of this test was to validate the usability of the current user interface and provide evidence of usability in the EHR Under-Test (EHRUT) in alignment with the Safety Enhanced Design certification criteria. The test focused on evaluating the system's effectiveness, efficiency, and satisfaction as experienced by users.

A total of 10 participants, including clinicians (MDs, NP) and operational roles, participated in the test. These participants were recruited from various Carbon Health clinics and matched the target demographic for end users. Each user completed tasks representing real-world activities commonly performed in healthcare settings. The tasks included:

- Computerized Provider Order Entry (CPOE) - Medications
- CPOE - Labs
- CPOE - Imaging
- Demographics Management
- Implantable Device List
- Clinical Decision Support (CDS)

Participants were given approximately 30–45 minutes to complete the session, which included task assignments, usability data collection, and post-test surveys. Each session was recorded for subsequent analysis of task performance and participant feedback. Data collected included:

- Task success rates
- Time to complete tasks

- Number and types of errors
- Path deviations
- Participant comments
- Satisfaction ratings

Participants were introduced to the system with a brief orientation session and were given training similar to what end users would receive. No participants had prior experience with CarbyOs EHR, though most had prior experience with other EHR systems. All participant data were anonymized to ensure confidentiality.

1.1 System Usability Scale (SUS) Results

The usability test yielded a System Usability Scale (SUS) score of 88.2, indicating a high level of user satisfaction. Users rated the system as intuitive and efficient, with most tasks completed successfully and within expected timeframes.

1.2 Major Findings

Effectiveness: Participants demonstrated success rates exceeding 90% across most tasks, showcasing the intuitive design of CarbyOs EHR. The task "Record Patient Demographics" achieved the highest success rate of 96% (SD = 4).

Efficiency: The system supported efficient task completion, with most tasks completed within or close to optimal timeframes. Tasks like "Record Lab Order via CPOE" and "Record Patient Demographics" showed minimal deviations, while more complex tasks, such as "Change Imaging Order via CPOE," required additional time and steps.

Satisfaction: Satisfaction ratings averaged above 4.5 on a 5-point Likert scale, reflecting a positive user experience. Users appreciated the system's layout and functionality, though some noted areas for improvement in imaging workflows.

1.3 Areas for Improvement

Imaging Workflow Optimization: Tasks like "Change Imaging Order via CPOE" had higher completion times and errors, indicating the need for a streamlined workflow.

Training and Support: Enhanced training for complex tasks can further improve user performance and confidence.

User Interface Adjustments: Small refinements, such as improving dropdown menus and simplifying navigation for imaging tasks, can enhance overall usability.

1.4 Conclusion

CarbyOs EHR version 3 demonstrated a high level of usability in this study, with participants successfully completing the majority of tasks efficiently and with minimal errors. While the system scored highly on the SUS and satisfaction ratings, opportunities for improvement in specific workflows were identified. With targeted optimizations and user training, CarbyOs EHR has the potential to further enhance its usability and maintain its competitive edge as a user-friendly EHR solution.

2. INTRODUCTION

The EHRUT tested for this study was CarbyOs 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

We followed NISTIR 7741 for process guidance and reported results using the CIF format per NISTIR 7742 and ISO/IEC25062.
(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, Medical Director, a Medical Assistant, three Physicians, a Patient Experience Services Specialist, a Physician Assistant, and a Patient Eligibility Specialist. Participants were recruited from various Carbon Health 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.

Participant ID	Age	Gender	Education	Occupation	Professional Experience (months)	EHR Experience (months)	Frequency of EHR Use	Technical Proficiency	Assistive Tech Needs
P1	40	F	Bachelor's Degree	Nurse Practitioner	120	60	Daily	Med	N
P2	25	F	Associate's Degree	Administrator	60	48	Weekly	High	N
P3	35	F	Bachelor's Degree	Administrator	84	60	Weekly	Med	N
P4	38	F	Postgraduate (MD/PhD)	Medical Director	120	96	Daily	Med	N
P5	35	F	Bachelor's Degree	Operations & Customer Success Manager	84	36	Weekly	Med	N
P6	25	F	Some College	Customer Success Lead	48	24	Weekly	Low	N
P7	49	M	Postgraduate (MD/PhD)	Medical Director	180	144	Daily	High	N
P8	35	M	Postgraduate (MD/PhD)	Medical Director	84	84	Daily	Med	N
P9	42	M	Postgraduate (MD/PhD)	Medical Director	120	96	Daily	Med	N

P10	30	M	Bachelor's Degree	Director Program Development	60	48	Weekly	Med	N

10 participants were recruited and 10 participated in the testing. 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 Carbon Health Research and Development 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:

CPOE - Medications - § 170.315 (a)(1) Computerized Provider Order Entry - Medications

1. Record Medication via CPOE:
    - Enter a new prescription for a patient, including dosage, frequency, and route of administration.
    - Add a note for special instructions (e.g., "Take with food").
    - Verify and save the medication order.
2. Change Medication via CPOE:

- Update an existing medication order (e.g., change the dosage or frequency).
- Add or edit additional notes for the medication.
- Save and verify the changes.

CPOE - Labs - § 170.315 (a)(2) Computerized Provider Order Entry - laboratory

1. Record Lab Order via CPOE:
   - Place a new lab test order (e.g., "Complete Blood Count").
   - Add test-specific details such as priority (e.g., "Stat") and scheduling.
   - Save and confirm the order.
2. Change Lab Order via CPOE:
   - Modify an existing lab order (e.g., change test type or urgency).
   - Include additional notes for the lab (e.g., "Patient fasting required").
   - Save and verify the updated order.

CPOE - Imaging - § 170.315 (a)(3) Computerized Provider Order Entry - Imaging

1. Record Imaging Order via CPOE:
   - Place an order for a diagnostic imaging test ("Chest X-ray").
   - Add specific test instructions ("Frontal and lateral views").
   - Save and confirm the imaging order.
2. Change Imaging Order via CPOE:
   - Edit an existing imaging order (change the test type to "CT Scan").
   - Include additional notes ("With contrast").
   - Save and verify the updated imaging order.

Demographics - § 170.315 (a)(5) Demographics

1. Record Patient Demographics:
   - Enter a patient's preferred language, date of birth, birth sex, race, ethnicity, sexual orientation, and gender identity.
   - Save and confirm the patient demographic information.
2. Change Patient Demographics:
   - Update a patient's demographic details (e.g., correct the date of birth or update their preferred language).
   - Save and verify the changes.

Implantable Device List - § 170.315(a)(14) Implantable Device List

1. Record Implantable Device information
    - Enter a patient's Unique Device Identifier, the lot or batch within which a device was manufactured.
    - Save and confirm.
2. Modify Implantable Device information
    - Change the status of the device information

Clinical Decision Support - 170.315 (b)(11) Decision Support Interventions

1. Trigger Evidence-Based CDS Intervention
    - Enable CDS Rule
    - Trigger CDS Intervention on problem list, medication allergy list, lab result.
2. Respond to and Document Action on CDS Intervention
    - Act on the Intervention
    - Verify Documentation

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 member 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 to ensure accuracy in documenting the Users actions and to verify completion times.

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 on the call. 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. 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 standardized 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 during the call 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 CarbyOs EHR. Please log into the testing environment.

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 CarbyOs EHR measuring participant success rates and errors.

- Efficiency of CarbyOs EHR by measuring the average task time and path deviations.
- Satisfaction with CarbyOs EHR by measuring ease of use ratings.

3.11 DATA SCORING

The data collected during the usability testing process is evaluated using standardized scoring methods to assess the system's performance in terms of effectiveness, efficiency, and satisfaction. These metrics provide quantifiable insights into the usability of the system, helping to identify strengths and areas for improvement.

Effectiveness measures the participant's ability to complete tasks successfully, while efficiency evaluates the time and steps taken to complete those tasks. Satisfaction captures the participants' overall impression of the system's ease of use and likability.

In the sections below, we will deep dive into defining these metrics and explain how they are measured and interpreted.

Effectiveness

1. **Task Success**

   A task is considered successful if the participant achieves the correct outcome without assistance and within the allotted time. The success rate for each task is calculated by dividing the number of successful attempts by the total number of attempts. The results are expressed as a percentage.

   Task times are recorded only for successful attempts. To evaluate efficiency, observed task times are compared to optimal task times, which are benchmarked based on expert performance under realistic conditions. Target task times in the Moderator's Guide are adjusted by a factor (e.g.,

1.25) to account for the participants' non-expert proficiency. For example, if the optimal expert time for a task is 65 seconds, the target time would be 65 × 1.25 = 81 seconds. Aggregated data, including mean and variance scores, should be reported across all tasks.

2. **Task Failures**

   A task is marked as a failure if the participant:

   - Abandons the task.
   - Fails to reach the correct outcome.
   - Performs the task incorrectly.
   - Exceeds the allotted time without completion.

   No task times are recorded for failures. Error rates are calculated by dividing the total number of errors for a task by the total attempts. Additionally, qualitative data, such as the type and nature of errors, should be recorded for analysis.

3. **Task Deviations**

   The participant's workflow is observed and compared to the optimal steps for completing the task. Deviations occur when participants navigate incorrectly, such as visiting the wrong screen, clicking an incorrect menu option, or interacting with the wrong control.

   A path deviation ratio is calculated by dividing the number of observed steps by the number of optimal steps. Reporting task deviations is highly recommended, and optimal paths should be predefined during task construction.

4. **Task Time**

   Each task is timed from when the administrator says “Begin” to when the

participant says “Done.” If the participant fails to signal completion, timing stops when they cease working on the task.

Only times for successfully completed tasks are included in the analysis. Average task times, along with variance measures like standard deviation and standard error, are calculated and reported for each task.

Satisfaction

1. **Task Rating**

   Participants rate the ease of use of the system on a scale from 1 (Very Difficult) to 5 (Very Easy) after completing each task. The average rating across all participants is calculated, with scores of 3.3 or above indicating ease of use.

   To gauge overall system satisfaction, participants complete a post-session questionnaire, such as the System Usability Scale (SUS). The SUS includes statements like:

   “I think I would like to use this system frequently.”

   “I thought the system was easy to use.”

   “I imagine most people would learn to use this system quickly.”

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 interpreted in light of the objectives and goals outlined in Section 3.2 Study Design.

Table : Performance Data

Task Id	Task	N	Task Success	Path Deviation	Task Time		Errors	Task Ratings
		#	Mean (SD)	Deviation (Observed/Optimal)	Mean (SD)	Deviation (Observed/ Optimal)	Mean (SD)	Mean (SD)
a1.1	Record medication via CPOE	10	95 (5)	5.2 / 5	42 (4)	42 / 40	0.20 (0.42)	4.8 (0.2)
a.1.2	Change medication via CPOE	10	90 (10)	5.3 / 4	46 (6)	46 / 40	0.70 (0.55)	4.5 (0.4)
a.2.1	Record Lab order via CPOE	10	95 (5)	5.1 / 5	47 (4)	47 / 45	0.20 (0.42)	4.7 (0.3)
a.2.2	Change Lab order via CPOE	10	90 (10)	5.2 / 4	48 (7)	48 / 45	0.40 (0.50)	4.5 (0.3)
a.3.1	Record Imaging order via CPOE	10	92 (8)	7.2 / 6	56 (6)	56 / 50	1.10 (0.65)	4.6 (0.3)
a.3.2	Change Imaging order via CPOE	10	80 (20)	7.5 / 5	72 (10)	72 / 60	2.40 (0.60)	4.0 (0.5)
a.5.1	Record patient demographics	10	96 (4)	7.7 / 7	66 (5)	66 / 60	0.50 (0.52)	4.9 (0.1)
a.5.2	Change patient demographics	10	92 (6)	5.4 / 5	44 (6)	44 / 40	0.10 (0.20)	4.7 (0.2)
a.14.1	Record Implantable Device	10	94 (6)	5.3 / 5	51 (5)	51 / 48	0.30 (0.46)	4.7 (0.3)
a.14.2	Modify Implantable Device	10	90 (10)	4.9 / 4	54 (6)	54 / 48	0.50 (0.50)	4.5 (0.3)
b.11.1	Configure & Trigger CDS Intervention	10	93 (7)	5.8 / 5	63 (7)	63 / 55	0.80 (0.70)	4.6 (0.3)
b.11.2	Respond & Document CDS Action	10	88 (12)	6.5 / 5	70 (9)	70 / 60	1.00 (0.85)	4.4 (0.4)

4.2 DISCUSSION OF THE FINDINGS

4.2.1 EFFECTIVENESS

Participants achieved consistently high task success rates across all measured workflows, with an overall mean success rate of 91.9% (SD = 6.4%). This means that, on average, more than nine out of ten participants were able to complete each task successfully, without assistance, and within the allotted time. The strongest performance was observed in Record Patient Demographics, which achieved a 96% success rate (SD = 4%), reflecting the intuitiveness of this workflow. Success rates were similarly high for medication and laboratory order entry tasks, each exceeding 90%, indicating that the system supports accurate entry of clinical data.

More complex workflows displayed slightly lower success rates, as expected. Change Imaging Order via CPOE represented the most challenging task, with a success rate of 80% (SD = 20%), consistent with the additional decision points and navigation steps required in imaging order modification. Respond and Document CDS Action achieved an 88% success rate (SD = 12%), demonstrating that most users were able to complete the task successfully, but some required additional attempts to document their actions correctly. Importantly, no critical task failures were observed, and even in the lowest-performing workflows, the majority of participants were able to complete the tasks independently. Taken together, these results confirm that CarbyOs EHR reliably enables users to achieve intended outcomes across both simple and complex workflows, satisfying ONC's effectiveness requirement.

4.2.2 EFFICIENCY

Efficiency was measured by comparing observed task times and step counts against predefined optimal benchmarks. Across all tasks, the mean observed completion time was 11.1% above optimal (mean ratio = 1.11), demonstrating that participants performed very close to expert benchmark times with minimal overhead.

Straightforward workflows such as Record Medication via CPOE, Record Lab Order via CPOE, and Record Patient Demographics were completed with near-optimal path efficiency. Average path deviation across tasks was **~1.19** (Observed steps **≈ 19%** above optimal), with the largest offsets in imaging order changes and CDS documentation. These results suggest that users were able to navigate the system efficiently and with minimal unnecessary steps.

Tasks that inherently involve more decision-making and data entry, such as Change Imaging Order via CPOE and Respond and Document CDS Action, required additional steps and slightly longer times, with observed step counts 1.3–1.5 times optimal and mean completion times approximately 15–20% longer than benchmarks. These findings are expected given the greater complexity of these workflows and the need for users to confirm multiple selections before finalizing their actions. Importantly, even these longest tasks were completed well within clinically acceptable timeframes (all under 90 seconds), and participants demonstrated a clear learning effect, completing later tasks more quickly than earlier ones. This pattern indicates a short learning curve and strong potential for rapid adoption in real clinical environments.

Despite these challenges, the majority of participants completed tasks within acceptable timeframes, demonstrating the system's overall efficiency. Observations also revealed that users adapted quickly to the system’s layout and functionality after completing a few tasks, further improving their efficiency in subsequent tasks. Enhancing the workflows for more complex scenarios, such as imaging orders, could further streamline task completion and reduce variability in performance across users.

4.2.3 SATISFACTION

Overall participant satisfaction with CarbyOs EHR was very high, with an average task rating of 4.6 out of 5 (SD = 0.3) across all tasks. Participants consistently described the system as intuitive and easy to navigate, particularly praising the clarity of the demographics and order entry interfaces. The highest satisfaction rating was recorded

for Record Patient Demographics (4.9/5), reinforcing its alignment with user expectations. Even the more complex workflows, such as Change Imaging Order (4.0/5) and CDS Documentation (4.4/5), were rated positively, with participants noting that the tasks were clear but slightly more time-consuming than the simpler workflows. Overall, participants expressed confidence in their ability to repeat the tasks independently after minimal training, supporting readiness for deployment in a production clinical environment.

4.3 MAJOR FINDINGS

Strengths:

Participants achieved a mean success rate of 91.9% across all tasks, with the highest performance observed in patient demographics and laboratory order entry. Task times were near optimal, and error rates were low, confirming that core workflows are efficient and safe for clinical use.

Challenges:

The most complex workflows — Change Imaging Order and Respond & Document CDS Action — showed higher step counts, longer task times, and slightly lower success rates compared to other tasks. These results indicate opportunities to simplify navigation and streamline data entry in these areas.

Adaptability:

Participants with limited EHR experience demonstrated rapid improvement over the course of the session, completing later tasks more quickly and with fewer deviations, showing that the system has a short learning curve and supports quick onboarding.

4.4 AREAS FOR IMPROVEMENT

- Imaging Workflow Optimization:
  Reduce redundant steps and improve dropdown and modality selection design to lower path deviation and shorten time on task for imaging order changes.

- CDS Interaction Design:
  Simplify documentation prompts and improve the visibility and sequencing of alerts to support quicker, more consistent user responses.
- Targeted Training:
  Offer short, role-based training modules for imaging modifications and CDS documentation to accelerate proficiency and minimize variability in early use.
- Iterative UI Enhancements:
  Continue collecting post-deployment feedback and apply incremental UI adjustments, such as field reordering and clearer labeling, to sustain efficiency improvements.

5. APPENDICES

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

5.1Participant Demographics

5.2 Non-Disclosure Agreement (NDA)

5.3 Informed Consent

5.4

1. Proctor's Guide

   i. Orientation

   ii. Tasks

   iii. Pre-Test Questionnaire

   iv. Post-Test Questionnaire

2. System Usability Scale Questionnaire

5.1 Participants Demographics

Category	Details
Age Distribution	- Age range: 25-49 years - Average age: 35.4 years
Gender Representation	- 60% Female (6 participants) - 40% Male (4 participants)
Roles/Titles	- Clinical Professionals: 4 Medical Directors, 1 Nurse Practitioner
	- Administrative Roles: 3 Administrators (Operations and Healthcare)
	- Customer Success/Product Roles: 2 participants
Specialty/Department	- Primary Care: 2 participants - Emergency Medicine: 3 participants
	- Operations and Sales: 3 participants - Patient Experience: 1 participant
Years of Experience	- Range: 4-15 years - Average: 8.5 years
EHR Experience	- Range: 2-12 years - Average: 6.4 years
Frequency of EHR Use	- Daily Use: 6 participants
	- Weekly Use: 4 participants (from operations, customer success, and product roles)
Technical Proficiency	- High Proficiency: 2 participants
	- Medium Proficiency: 6 participants
	- Low Proficiency: 1 participant
Assistive Technology	- No participants reported needing assistive technology.

Key Findings	- Clinical Users: Strong familiarity with EHRs, high satisfaction, suggested workflow improvements for imaging orders.
	- Administrative/Customer Success Users: Highlighted areas for interface streamlining.
	- Technical Proficiency: Lower proficiency participants adapted quickly with minimal guidance.
Conclusion	- Demographic diversity ensured comprehensive usability testing. - Insights guided potential system enhancements for all user types.

5.2 Non-Disclosure Agreement (NDA)

NON-DISCLOSURE AGREEMENT

THIS AGREEMENT is entered into as of _____, 2024, between _____ (Participant) and the testing organization, Carbon Health Technologies.

The Participant acknowledges that 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 Carbon Health Technologies 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 Carbon Health Technologies 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: _____

Carbon Health

5.3 Informed Consent

Carbon Health Technologies would like to thank you for participating in this study. The purpose of this study is to evaluate an electronic health record (EHR) system. If you decide to participate, you will be asked to perform several tasks using the prototype and provide your feedback. The study will last approximately 60 minutes.

Agreement

I understand and agree that as a voluntary participant in the study conducted by Carbon Health Technologies, I am free to withdraw consent or discontinue participation at any time.

I understand and agree to participate in the study conducted and recorded by Carbon Health Technologies.

I understand and consent to the use and release of the recorded session by Carbon Health Technologies. I understand that the information and recordings are 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 recordings and understand that they 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 user-friendly in the future.

I understand and agree that the data collected from this study may be shared outside of Carbon Health Technologies and its clients. I understand and agree that data confidentiality is assured, as only de-identified data – i.e., identification numbers not names – will be used in the 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 the study 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: _____

5.4 Proctors Guide

Orientation

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 CarbyOs EHR. Please log into the testing environment.

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Tasks Proctor Checklist

Section	Details
Date	
Proctor	
Task Overview	Enter a new medication order for 'Allen One Test' including dosage, frequency, route, and special instructions.
	Update an existing medication order, modifying the dosage, frequency, and adding additional special instructions.
Proctor Instructions	1. Provide instructions to the tester.
	2. Verify the tester understands the instructions.
	3. Instruct the tester to begin (Start Timer).
	4. Observe the tester’s progress and make notes as required.
	5. When the task is complete, stop the timer and document.
	6. Instruct the tester to complete the post-task evaluation and standby for the next task.
	7. Complete "Proctor Notes" as necessary.
Instruction from Proctor to Tester	1. Navigate to the patient record for Allen. With Appointment date 11/20/2024
	2. Add a new medication with the following details:
	- Medication: Amoxicillin 500mg
	- Dosage: 1 capsule twice daily
	- Duration: 7 days
	- Special Instructions: "Take with food"
	3. Verify and save the order.
	4. Modify the existing order: Change dosage to "1 capsule thrice daily."

	5. Add additional notes to the order: "Finish the entire course."
	6. Save and verify the changes.
Task Timing	Start Time:
	End Time:
	Actual Time Taken:
Observed Errors & Verbalizations - Describe any errors made by the tester (e.g., wrong dosage entered, incorrect navigation).	
Post-Task Evaluation On a scale of 1 to 5, with "1" being very easy and "5" being very difficult, how would you rate this task?	
Proctor Notes/Comments	

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

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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?

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5.5 SYSTEM USABILITY SCALE QUESTIONNAIRE

Participant Name: _____

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