



Powerful. Proven. Free.

EHR USABILITY TEST REPORT OF MED A-Z 202001

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

Med A-Z 202001
Ambulatory EHR Safety Enhanced Design Test Report

Prepared By Arvind Vasudevan
Email: Vasu@medaz.net
Phone: +1 (609) 716-6991

EHR Usability Test Report of Med A-Z 202001

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

Med A-Z 202001

Date of Usability Test: 02/26/2023;3/24/23; 3/28/23; 3/29/23; 4/03/23; 4/19/23;
4/25/23

Date of Report: 05/06/2023

Report Prepared By: Vasu S Iyengar - CIO

Med A-Z.net LLC

1 (609) 716-6991

Vasu@medaz.net

379 Princeton Hightstown Road, Bldg2 -Ste2A

East Windsor, NJ 08512

TABLE OF CONTENTS

EXECUTIVE SUMMARY	3
INTRODUCTION	7
METHOD	8
PARTICIPANTS	8
STUDY DESIGN	9
TASKS.....	10
PROCEDURE.....	11
TEST LOCATION	12
TEST ENVIRONMENT	12
TEST FORMS AND TOOLS.....	13
PARTICIPANT INSTRUCTIONS	13
USABILITY METRICS.....	14
DATA SCORING	15
RESULTS.....	18
DATA ANALYSIS AND REPORTING	18
DISCUSSION OF FINDINGS.....	21
APPENDICES.....	22
APPENDIX 1: RECRUITING SCREENER	22
APPENDIX 2: PARTICIPANT DEMOGRAPHICS.....	25
APPENDIX 3: INFORMED CONSENT FORM.....	26
APPENDIX 4: MODERATOR’S GUIDE.....	27
APPENDIX 5: SYSTEM USABILITY SCALE QUESTIONNAIRE	35

EXECUTIVE SUMMARY

A usability test of Med A-Z, version 202001, Ambulatory EMR was conducted on 2/26/23, 3/24/23, 3/28/23, 3/29/23, 4/03/23, 4/19/23, and 4/25/23, remotely from Med A-Z.net LLC office by Med A-Z.net LLC employees. This report was prepared using NISTIR 7741(Schumacher, R. and Lowry, S. (2010), (NISTIR 7741) NIST Guide to the Processes Approach for Improving the Usability of Electronic Health Records, NIST Interagency/Internal Report (NISTIR), National Institute of Standards and Technology, Gaithersburg, MD, [online], <https://doi.org/10.6028/NIST.IR.7741>, https://tsapps.nist.gov/publication/get_pdf.cfm?pub_id=907313 (Accessed May 3, 2023)), . The purpose of this test was to test and validate the usability of the current user interface and provide evidence of usability in the EHR Under Test (EHRUT). During the usability test, 13 healthcare providers and nursing staff members matching the target demographic criteria served as participants and used the EHRUT in simulated, but representative tasks.

This study collected performance data on 8 tasks typically conducted on an EHR:

Front Desk Users:

- ((a)(5)) - Demographics
 - Enter Demographic information for test patient

Physician/Registered Nurse/Nurses:

- ((a)(1)) - CPOE Medications
 - Electronically enter test patient prescription info
- ((a)(2)) - CPOE Laboratory
 - Electronically enter test patient lab test order
- ((a)(3)) - CPOE Diagnostic Imaging
 - Electronically enter test patient diagnostic imaging test order

- ((a)(4)) - Drug-Drug, drug-Allergy Interactions for CPOE
 - View DD/DI check after electronically entering test patient prescription info
- ((a)(9)) - Clinical decision support (CDS)
 - View clinical decision support resources
- ((a)(14)) - Implantable Device List
 - Lookup and add test patient implantable device by UDI
- ((b)(3)) - Electronic Prescribing
 - Send test patient prescription to SureScripts

During the 45-minute one-on-one usability test, each participant was greeted by the administrator and asked to review and sign an informed consent/release form (included in Appendix 3); they were instructed that they could withdraw at any time. All participants had prior experience with the EHR via a preliminary 20-minute transition training session 1 week prior to usability test. The administrator introduced the test and instructed participants to complete a series of tasks (given one at a time) using the EHRUT. During the testing, the administrator timed the test and, along with the data logger's recorded user performance data on paper and electronically. The administrator did not give the participant assistance in how to complete the task. Participant screens, head shots and audio were recorded for subsequent analysis.

The following types of data were collected for each participant:

- Number of tasks successfully completed within the allotted time without assistance
- Time to complete the tasks
- Number and types of errors
- Path deviations
- Participant's verbalizations

- Participant's satisfaction ratings of the system

All participant data was de-identified – no correspondence could be made between the participant's identity and the data collected. After the testing, participants were asked to complete a post-test questionnaire. Various recommended metrics, in accordance with the examples set forth in the *NIST Guide to the Processes Approach for Improving the Usability of Electronic Health Records*, were used to evaluate the usability of the EHRUT. Following is a summary of the performance and rating data collected on the EHRUT.

Measure	N	Task Success	Path Deviations	Task time		Errors	Task Rating
Task	#	Mean (SD)	Deviations (Observed/Optimal)	Mean (SD)	Deviations (Observed/Optimal)	Mean (SD)	Mean (SD)
A1 - Electronically enter test patient prescription info	13	100(0)	14/12	119(9)	119/95	0(0)	4.08(0.76)
A2 - Electronically enter test patient lab test order	13	100(0)	12/11	111(4)	111/98	0(0)	4.15(0.69)
A3 - Electronically enter test patient diagnostic imaging test order	13	100(0)	13/12	123(11)	123/98	0(0)	4.46(0.66)
A4 - View DD/DI check after electronically entering test patient	13	100(0)	14/13	133(7)	133/115	0(0)	4.08(0.76)

prescription info							
A5 - Enter Demographic information for test patient	13	100(0)	8/7	66(8)	66/45	0(0)	4.15(0.90)
A9 - View clinical decision support resources	13	100(0)	12/10	80(5)	80/65	0(0)	3.9(0.76)
A14 - Lookup and add test patient implantable device by UDI	13	100(0)	13/11	118(8)	118/95	0(0)	4.08(.076)
B3 - Send test patient prescription to Surescripts	13	100(0)	14/13	118(7)	118/90	0(0)	3.46(0.66)

Table 1: Usability test results.

The results from the System Usability Scale scored the subjective satisfaction with the system based on performance with these tasks to be: 76.46.

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

Major Findings:

Users felt the system had all the features needed but were somewhat tentative while navigating through the system. The system is fully functional, but everyday usability can be further improved upon with thoughtful design updates.

Areas for Improvement:

- Add potential autofill options to streamline charting.
- Update menu organization to streamline workflows.
- Make side menu is collapsible based on user preference.
- Display patient last visit date when prescriptions are renewed.

INTRODUCTION

The EHRUT(s) tested for this study was Med A-Z 202001 Ambulatory. Designed to present medical information to healthcare providers in ambulatory clinical settings, the EHRUT consists of a web browser based EHR client and cloud hosted SQL Server backend. The usability testing attempted to represent realistic exercises and conditions.

This study's purpose 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 task path deviations and task errors were captured during the usability testing.

METHOD

PARTICIPANTS

13 participants were tested on the EHRUT(s). Participants in the test were a mix of Physicians, nurses, and front desk users. Participants were recruited by Med A-Z.net LLC and were not compensated for their time. In addition, participants had no direct connection to the development of or organization producing the EHRUT. Participants were not from the testing or supplier organization. Participants were given the same orientation and training level as the actual end users would have received.

For the test purposes, end-user characteristics were identified and translated into a recruitment screener used to solicit potential participants; an example of a screener is provided in Appendix [1]. Recruited participants had a mix of backgrounds and demographic characteristics conforming to the recruitment screener. The following is a table of participants by characteristics, including demographics, professional experience, computing experience, and user needs for assistive technology. Participant names were replaced with Participant IDs so that an individual's data cannot be tied back to individual identities. 13 participants (matching the demographics in the section on Participants) were recruited and 13 participated in the usability test. 0 participants failed to show up for the study. Participants were scheduled for 2 sessions, with a gap of several days in between each session for debrief by the administrator(s) and data logger(s), and to reset systems to proper test conditions. The lack of availability of test subjects also influenced the timeline. A spreadsheet was used to keep track of the participant schedule and included each participant's demographic characteristics as provided by the recruiting firm.

Participant Identifier	Participant Gender	Participant Age	Participant Education	Participant Occupation/Role	Participant Professional Experience	Participant Computer Experience	Participant Product Experience	Participant Assistive Technology Needs
P1	Female	30-39	High school graduate, diploma, or the equivalent (for example: GED)	Receptionist	10	12	31	No
P2	Female	20-29	High school graduate, diploma, or the equivalent (for example: GED)	Administrator Assistant	60	48	48	No
P3	Female	30-39	Associate degree	Clinical Assistant	72	200	72	No
P4	Female	30-39	Some college credit, no degree	Intake Representative	72	72	72	No
P5	Female	40-49	Trade/technical/vocational training	Clinical Assistant	315	315	140	No
P6	Female	40-49	Some college credit, no degree	Office Manager	72	72	72	No
P7	Female	30-39	Associate degree	Nurse	216	180	120	No
P8	Female	40-49	Trade/technical/vocational training	Clinical Assistant	276	276	120	No
P9	Female	50-59	Master's degree	Advanced Practice registered nurse	240	360	48.5	No
P10	Female	60-69	Associate degree	Nuclear Technologist	360	240	60	No
P11	Female	40-49	Doctorate degree (e.g., MD, DNP, DMD, PhD)	Physician	300	288	60	No
P12	Male	50-59	Doctorate degree (e.g., MD, DNP, DMD, PhD)	Physician	420	360	180	No
P13	Male	50-59	Doctorate degree (e.g., MD, DNP, DMD, PhD)	Physician	480	300	120	No

Table 2: Participants Demographics

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 1 EHR, Med A-Z 202001. Each participant used the system hosted in the same manner and was provided with the same instructions. The system was evaluated for effectiveness, efficiency and satisfaction as defined by measures collected and analyzed for each participant:

- Number of tasks successfully completed within the allotted time without assistance
- Time to complete the tasks
- Number and types of errors

- Path deviations
- Participant's verbalizations (comments)
- Participant's satisfaction ratings of the system

Additional information about the various measures can be found in Section 3.9 on Usability Metrics.

TASKS

Tasks were constructed that would be realistic and representative of the kinds of activities a user might do with this EHR, including:

1. Front Desk Users:
 - a. Demographics((a)(5)) - Enter Demographic information for test patient
2. Physician/Registered Nurses/Nurses:
 - a. CPOE Medications((a)(1)) - Electronically enter test patient prescription info
 - b. CPOE Laboratory((a)(2)) - Electronically enter test patient lab test order
 - c. CPOE Diagnostic Imaging((a)(3)) - Electronically enter test patient diagnostic imaging test order
 - d. Drug-Drug, drug-Allergy Interactions for CPOE((a)(4)) - View DD/DI check after electronically entering test patient prescription info
 - e. Clinical decision support (CDS) ((a)(9)) - View clinical decision support resources
 - f. Implantable Device List((a)(14)) - Lookup and add test patient implantable device by UDI
 - g. Electronic Prescribing((b)(3)) - Send test patient prescription to Surescripts

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

PROCEDURE

Upon arrival, participants were greeted; their identity was verified and matched with a name on the participant schedule. Participants were then assigned a participant ID. Each participant reviewed and signed an informed consent and release form (See Appendix 3). A representative from the test team witnessed the participant's signature.

To ensure that the test ran smoothly, two staff members participated in this test, the usability administrator, and the data logger. The usability testing staff conducting the test was experienced usability practitioners: test administrator's educational background includes an Executive MBA from Georgia State University, master's in science with Electronics, Post Graduate Diploma in Software Technology, and a Post Graduate Diploma in Computer Technology with 23 years' experience in health IT. Data logger's educational background is a Bachelor of Computer Science, with 6 years' experience in health IT. The administrator moderated the session including administering instructions and tasks. The administrator also monitored task times, obtained post-task rating data, and took notes on participant comments. A second person served as the data logger and took notes on task success, path deviations, number and type of errors, and comments.

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

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

For each task, the participants were given a written copy of the task. Task timing began once the administrator finished reading the question. The task time was stopped once the participant indicated they had successfully completed the task. Scoring is discussed below in Section 3.9.

Participants' demographic information, task success rate, time on task, errors, deviations, verbal responses, and post-test questionnaire were recorded into a spreadsheet. Following the session, the administrator gave the participant the post-test questionnaire (e.g., the System Usability Scale, see Appendix 5), then ended the recording session, closing by thanking each participant for their participation and their time.

TEST LOCATION

All tests were administered remotely over several days via Zoom. Participants self-selected a location with adequate internet connectivity and working conditions. Only the participant and administrator were in the meeting at any given time. All observers and the data logger worked from a recording of the meeting, where they could see the participant's screen and face shot, with unlimited opportunities to review the recording.

TEST ENVIRONMENT

The EHRUT would typically be used in a healthcare office or facility. In this instance, the testing was conducted in client offices. For testing, the computers used were Desktops running Windows 10. All computers used are machines the participants would use when normally conducting their work. The participants used a mouse and keyboard when interacting with the EHRUT.

The EHRUT used 1920 X 1080 screen resolution, landscape orientation, with Windows 10 default fonts, sizes, and Windows HD Color enabled. The application was set up by Med A-Z.net LLC. in accordance with documentation describing the system set-up and preparation. The application itself was running on a local IIS server instance, using a test database on a LAN connection. Technically, the system performance (i.e., response time) was representative of what actual users would experience in a field implementation. Also, participants were told not to change any default system settings (such as control of font size).

TEST FORMS AND TOOLS

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

1. Informed Consent
2. Moderator's Guide
3. Post-test Questionnaire

Examples of these documents can be found in Appendices 3-5 respectively. The Moderator's Guide was devised to capture required data. The participant's interaction with the EHRUT was captured and recorded digitally with screen capture software running on the test machine. Zoom/gotomeeting meetings were recorded for each participant. The test sessions were saved and reviewed later in a nearby observation room by the data logger.

PARTICIPANT INSTRUCTIONS

The administrator reads the following instructions aloud to each participant (also see the full moderator's guide in Appendix 4):

Thank you for participating in this study. Your input is especially important. Our session today will last about 45 minutes. During that time, you will use an instance of an electronic health record. I will ask you to complete a few tasks using this system and answer some questions. You should complete the tasks as quickly as possible, making as few errors as possible. Please try to complete the tasks on your own following the instructions very closely. Please note that we are not testing you we are testing the system, therefore if you have difficulty all this means is that something needs to be improved in the system. I will be here in case you need specific help, but I am not able to instruct you or provide help in how to use the application. Overall, we are interested in how easy (or how difficult) this system is to use, what in it would be useful to you, and how we could improve it. I did not

have any involvement in its creation, so please be honest with your opinions. All of the information that you provide will be kept confidential and your name will not be associated with your comments at any time. Should you feel it necessary you are able to withdraw at any time during the testing.

Following the procedural instructions, participants were shown the EHR and as their first task, were given time (10 minutes) to explore the system and make comments. Once this task was complete, the administrator gave the following instructions:

For each task, I will read the description to you and say "Begin." At that point, please perform the task and say "Done" once you believe you have successfully completed the task. I would like to request that you not talk aloud or verbalize while you are doing the tasks. I will ask you your impressions about the task once you are done.

Participants were then given 8 tasks to complete. Tasks are listed in the moderator's guide in Appendix 4.

USABILITY METRICS

According to the *NIST Guide to the Processes Approach for Improving the Usability of Electronic Health Records*, EHRs should support a process that provides a high level of usability for all users. The goal is for users to interact with the system effectively, efficiently, and with an acceptable level of satisfaction. To this end, metrics for

effectiveness, efficiency and user satisfaction were captured during the usability testing. The goals of the test were to assess:

1. Effectiveness of MED A-Z 202001 by measuring participant success rates and errors
2. Efficiency of MED A-Z 202001 by measuring the average task time and path deviations
3. Satisfaction with MED A-Z 202001 by measuring ease of use ratings

DATA SCORING

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

Table 3: Data Scoring

Measures	Rationale and Scoring
Effectiveness: Task Success	<p>A task was counted as a “Success” if the participant were able to achieve the correct outcome, without assistance, within the time allotted on a per task basis. The total number of successes was calculated for each task and then divided by the total number of times that task was attempted. The results are provided as a percentage. Task times were recorded for successes. Observed task times divided by the optimal time for each task is a measure of optimal efficiency. Optimal task performance time, as benchmarked by expert performance under realistic conditions, is recorded when constructing tasks. Target task times used for task times in the Moderator’s Guide must be operationally defined by taking multiple measures of optimal performance and multiplying by some factor, <i>Expert time X 1.25</i>, that allows some time buffer because the participants are presumably not trained to expert performance. Thus, if expert, optimal performance on</p>

	<p>a task was 20 seconds then allotted task time performance was 25 seconds. This ratio should be aggregated across tasks and reported with mean and variance scores.</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. The total number of errors was calculated for each task and then divided by the total number of times that task was attempted. Not all deviations would be counted as errors. This should also be expressed as the mean number of failed tasks per participant. On a qualitative level, an enumeration of errors and error types should be collected.</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 interacted incorrectly with an on-screen control. This path was compared to the optimal path. The number of steps in the observed path is divided by the number of optimal steps to provide a ratio of path deviation. 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:</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.</p> <p>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. 12 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 Med A-Z 202001 overall, the testing team administered the System Usability Scale (SUS) post-test questionnaire.</p> <p>Questions included, “I think I would like to use this system frequently,” “I thought the system was easy to use,” and “I would imagine that most people would learn to use this system very quickly.” See full System Usability Score questionnaire in Appendix 5</p>
---	--

RESULTS

DATA ANALYSIS AND REPORTING

The results of the usability test were calculated according to the methods specified in the Usability Metrics section above.

Satisfaction:

System Usability Scale Results

Question	Score
I think that I would like to use this system frequently.	4.307692308
I found the system unnecessarily complex.	1.461538462
I thought the system was easy to use.	4.384615385
I think that I would need the support of a technical person to be able to use this system.	2.230769231
I found the various functions in this system were well integrated.	4.615384615
I thought there was too much inconsistency in this system.	1.307692308
I would imagine that most people would learn to use this system very quickly.	4.230769231

I found the system very cumbersome to use.	1.461538462
I felt very confident using the system.	4.153846154
I needed to learn a lot of things before I could get going with this system.	2
Score	76.46153846

Table 4: SUS results

The usability testing results for the EHRUT are detailed below (see Table 4). The results should be seen considering the objectives and goals outlined in Section 3.2 Study Design. The data should yield actionable results that, if corrected, yield material, positive impact on user performance.

Usability Test Results

Measure	N	Task Success	Path Deviations	Task time		Errors	Task Rating
Task	#	Mean (SD)	Deviations (Observed/Optimal)	Mean (SD)	Deviations (Observed/Optimal)	Mean (SD)	Mean (SD)
A1 - Electronically enter test patient prescription info	13	100(0)	14/12	119(9)	119/95	0(0)	4.08(0.76)
A2 - Electronically enter test patient lab test order	13	100(0)	12/11	111(4)	111/98	0(0)	4.15(0.69)

A3 - Electronically enter test patient diagnostic imaging test order	13	100(0)	13/12	123(11)	123/98	0(0)	4.46(0.66)
A4 - View DD/DI check after electronically entering test patient prescription info	13	100(0)	14/13	133(7)	133/115	0(0)	4.08(0.76)
A5 - Enter Demographic information for test patient	13	100(0)	8/7	66(8)	66/45	0(0)	4.15(0.90)
A9 - View clinical decision support resources	13	100(0)	12/10	80(5)	80/65	0(0)	3.9(0.76)
A14 - Lookup and add test patient implantable device by UDI	13	100(0)	13/11	118(8)	118/95	0(0)	4.08(.076)
B3 - Send test patient prescription to Surescripts	13	100(0)	14/13	118(7)	118/90	0(0)	3.46(0.66)

Table 1: Usability Test Results

The results from the SUS (System Usability Scale) scored the subjective satisfaction with the system based on performance with these tasks to be: 76.46

DISCUSSION OF FINDINGS

Effectiveness:

Test users found that the software was more effective than expected. Faster load times, responsive web pages, quick 2-Factor authentication, and added conveniences, such as the ability to save login credentials in browser were chiefly cited.

Efficiency:

Test Users cited a noticeable drop in efficiency. Added documentation overhead created by new requirements and the need to adjust to new menu layouts were chiefly cited reasons. During administration of tests, it was observed that users checked multiple menus before proceeding to the correct task menu.

Satisfaction:

Overall, test users were largely satisfied with the SUT. Users expressed optimism that the updated system could improve their office workflows.

Major Findings:

Users felt the system had all the features needed but were somewhat tentative while navigating through the system. The system is fully functional, but everyday usability can be further improved upon with thoughtful design updates.

Areas for Improvement:

- Add potential autofill options to streamline charting.
- Update menu organization to streamline workflows.
- Make side menu is collapsible based on user preference.
- Display patient last visit date when prescriptions are renewed.

APPENDICES

APPENDIX 1: RECRUITING SCREENER

Recruiting Script

Hello, my name is Vasu Iyengar, calling from Med A-Z.net LLC. We are recruiting individuals to participate in a usability study for an electronic health record. We would like to ask you a few questions to see if you qualify and if you would like to participate. This should only take a few minutes of your time. This is strictly for research purposes. If you are interested and qualify for the study, you will be paid to participate. Can I ask you a few questions?

Customize this by dropping or adding questions so that it reflects your EHR's primary audience

1. Are you male or female?
2. Have you participated in a focus group or usability test in the past xx months?
3. Do you, or does anyone in your home, work in marketing research, usability research, web design [...etc.]?
4. Do you, or does anyone in your home, have a commercial or research interest in an electronic health record software or consulting company?
5. Which of the following best describes your age? [23 to 39; 40 to 59; 60 - to 74; 75 and older]
6. Which of the following best describes your race or ethnic group? [e.g., Caucasian, Asian, Black/African American, Latino/a or Hispanic, etc.]
7. Do you require any assistive technologies to use a computer? [if so, please describe]

Professional Demographics:

8. What is your current position and title? (Must be healthcare provider)

RN: Specialty _____

Physician: Specialty _____

Resident: Specialty _____

Administrative Staff

Other [Terminate]

9. How long have you held this position?

10. Describe your work location (or affiliation) and environment? (Recruit according to the intended users of the application) [e.g., private practice, health system, government clinic, etc.]

11. Which of the following describes your highest level of education? [e.g., high school graduate/GED, some college, college graduate (RN, BSN), postgraduate (MD/PhD), other (explain)]

Computer Expertise:

12. Besides reading email, what professional activities do you do on the computer? [e.g., access EHR, research; reading news; shopping/banking; digital pictures; programming/word processing, etc.] [If no computer use at all, Terminate]

13. About how many hours per week do you spend on the computer? [Recruit according to the demographics of the intended users, e.g., 0 to 10, 11 to 25, 26+ hours per week]

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

15. What Internet browser(s) do you usually use? [e.g., Firefox, IE, AOL, etc.]

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

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

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

19. How does your work environment patient records? [Recruit according to the demographics of the intended users]

On paper

Some paper, some electronic

All electronic

Contact Information If the person matches your qualifications, ask

Those are all the questions I have for you. Your background matches the people we are looking for.

Would you be able to participate on [date, time]?

May I get your contact information?

Name of participant:

Address:

City, State, Zip:

Daytime phone number:

Evening phone number:

Alternate [cell] phone number:

Email address:

Before your session starts, we will ask you to sign a release form allowing us to videotape your session. The videotape will only be used internally for further study if needed. Will you consent to be videotaped?

This study will take place on Zoom. I will confirm your appointment a couple of days before your session and provide you with directions to our office. What time is the best time to reach you?

APPENDIX 2: PARTICIPANT DEMOGRAPHICS

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

Gender

Men [2]

Women [11]

Total (participants) [13]

Occupation/Role

RN/BSN [6]

Physician [3]

Admin Staff [4]

Total (participants) [13]

Years of Experience

Years experience [X]

Facility Use of EHR

All paper [0]

Some paper, some electronic [0]

All electronic [13]

Total (participants) [13]

[Full Participant Breakdown]

APPENDIX 3: INFORMED CONSENT FORM

Med A-Z.net LLC would like to thank you for participating in this study. The purpose of this study is to evaluate an electronic health records system. If you decide to participate, you will be asked to perform several tasks using the prototype and give your feedback. The study will last about 45 minutes. We appreciate your time today!

Agreement:

I understand and agree that as a voluntary participant in the present study conducted by Med A-Z.net LLC I am free to withdraw my consent or discontinue participation at any time. I understand and agree to participate in the study conducted and videotaped by Med A-Z.net LLC.

I understand and consent to the use and release of the videotape by Med A-Z.net LLC. I understand that the information and videotape 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 videotape and understand the videotape may be copied and used by Med A-Z.net LLC without further permission.

I understand and agree that the purpose of this study is to make software applications more useful and usable in the future.

I understand and agree that the data collected from this study may be shared with parties outside of Med A-Z.net LLC and Med A-Z.net LLC'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: _____

APPENDIX 4: MODERATOR'S GUIDE

Orientation (5 minutes)

Thank you for participating in this study. Our session today will last 45 minutes. During that time you will take a look at an electronic health record system.

I will ask you to complete a few tasks using this system and answer some questions. We are interested in how easy (or how difficult) this system is to use, what in it would be useful to you, and how we could improve it. You will be asked to complete these tasks on your own trying to do

them as quickly as possible with the fewest possible errors or deviations. Do not do anything more than asked. If you get lost or have difficulty, I cannot answer help you with anything to do with the system itself. Please save your detailed comments until the end of a task or the end of the session as a whole when we can discuss freely.

I did not have any involvement in its creation, so please be honest with your opinions.

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

We are recording the audio and screenshots of our session today. All of the information that you provide will be kept confidential and your name will not be associated with your comments at any time.

Do you have any questions or concerns?

Preliminary Questions (5 minutes)

What is your job title / appointment?

How long have you been working in this role?

What are some of your main responsibilities?

Tell me about your experience with electronic health records.

Task 1 Procedure(a5):

Step 1: Open Google Chrome and Enter URL <https://medazdemo.mhealthaz.com> to proceed to the login page. Enter Username and Password. Click Agree checkbox to log in.

Step 2: Select 2-Factor Authentication code delivery option (Email OR Phone code) and enter security code. Security code will be sent to a pre-registered Email address or Phone number, based on user selection.

Step 3: Select Practice information and facility information in dropdown and proceed to Med A-Z Tiles page.

Step 4: Select the EHR Tile to proceed to Med A-Z workflow.

Step 5: After EHR selection, workflow window.

Step 6: Go to Patient demographics in Registration dropdown.

Step 7: View patient list. Click add patient to record new patient information, patient code will generate automatically.

Step 8: Enter the patient's demographic information.

Step 9: Fill in mandatory fields. Race, ethnicity, preferred language, sex, sexual orientation, and gender identity have Decline to Specify as an option.

Step 10: After saving, updated patient information is shown in the patient list. Click Edit to view/update the patient information.

Task 2 Procedure(a1):

Step 1: Open Google Chrome and Enter URL <https://medazdemo.mhealthaz.com> to proceed to the login page. Enter User id and Password. Click Agree checkbox and Login.

Step 2: Select 2-Factor Authentication code delivery option (Email OR Phone code) and enter security code. Security code will be sent to a pre-registered Email address or Phone number, based on your previous selection.

Step 3: Select Practice information and facility information in dropdown and proceed to Med A-Z Tiles page.

Step 4: Select the EHR Tile to proceed to Med A-Z application Flow

Step 5: Under the examination menu, select Examine Patient.

Step 6: Search for target patient. Enter Search term and select appropriate Search By.

Step 7: Select target patient to be examined. Double click to select.

Step 8: View Visit information. Click chart to view detailed information about patient visits.

Step 9: View Patient chart. Select Medication Orders from the left side menu.

Step 10: Click the Add New button to enter medication.

Step 11: Enter WARFARIN SODIUM medication and search.

Step 12: Select appropriate drug from lookup by double clicking.

Step 13: View Real Time formulary responses for preferred medications

Task 3 Procedure(a2):

Step 1: Open Google Chrome and Enter URL <https://medazdemo.mhealthaz.com> to proceed to the login page. Enter User id and Password. Click Agree checkbox and Login.

Step 2: Select 2-Factor Authentication code delivery option (Email OR Phone code) and enter security code. Security code will be sent to a pre-registered Email address or Phone number, based on your previous selection.

Step 3: To choose email code dropdown from select provider.

Step 4: Choose phone code from select provider dropdown.

Step 5: Security code will send preauthorized email/phone based on your previous selection.

Step 6: Select Practice information and facility information in dropdown and proceed to Med A-Z Tiles page.

Step 7: Select the EHR Tile to proceed to Med A-Z workflow.

Step 8: After EHR selection, workflow window.

Step 9: Go to examine patient in Examination dropdown.

Step 10: Enter appropriate search to find target patient.

Step 11: Double click the target patient to be examined.

Step 12: Click patient chart to view detailed information about patient present/previous visits.

Step 13: Select Test Orders from the left side menu.

Step 14: Click New to record a new Test order.

Step 15: Enter the Test name and search using the “+” symbol.

Step 16: Double click appropriate test from search results.

Step 17: Enter the lab and appropriate information, click on save to preserve the data.

Step 18: After save, click edit to change any information.

Step 19: After making the changes in data, click save to preserve data.

Task 4 Procedure(a3):

Step 1: Open Google Chrome and Enter URL <https://medazdemo.mhealthaz.com> to proceed to the login page. Enter User id and Password. Click Agree checkbox and Login.

Step 2: Select 2-Factor Authentication code delivery option (Email OR Phone code) and enter security code. Security code will be sent to a pre-registered Email address or Phone number, based on your previous selection.

Step 3: To choose email code dropdown from select provider.

Step 4: Choose phone code from select provider dropdown.

Step 5: Security code will send preauthorized email/phone based on your previous selection.

Step 6: Select Practice information and facility information in dropdown and proceed to Med A-Z Tiles page.

Step 7: Select the EHR Tile to proceed to Med A-Z workflow.

Step 8: After EHR selection, workflow window.

Step 9: Go to examine patient in Examination dropdown.

Step 10: Enter appropriate search to find target patient.

Step 11: Double click the target patient to be examined.

Step 12: Click patient chart to view detailed information about patient present/previous visits.

Step 13: Select Test Orders from the left side menu.

Step 14: Click New to record a new Test order.

Step 15: Enter radiology into category and search.

Step 16: Double click appropriate test from search results.

Step 17: Enter the lab and appropriate information, click on save to preserve the data.

Step 18: After save, click edit to change any information.

Task 5 Procedure(a4):

Step 1: Open Google Chrome and Enter URL <https://medazdemo.mhealthaz.com> to proceed to the login page. Enter User id and Password. Click Agree checkbox and Login.

Step 2: Select 2-Factor Authentication code delivery option (Email OR Phone code) and enter security code. Security code will be sent to a pre-registered Email address or Phone number, based on your previous selection.

Step 3: To choose email code dropdown from select provider.

Step 4: Choose phone code from select provider dropdown.

Step 5: Security code will send preauthorized email/phone based on your previous selection.

Step 6: Select Practice information and facility information in dropdown and proceed to Med A-Z Tiles page.

Step 7: Select the EHR Tile to proceed to Med A-Z workflow.

Step 8: Go to examine patient in Examination dropdown.

Step 9: Enter an appropriate search term to find the target patient.

Step 10: Double click the target patient to be examined.

Step 11: Click patient chart to view detailed information about patient present/previous visits.

Step 12: Select Problem list in left side menu.

Step 13: Click Add New button to select medication.

Step 14: Type the Drug (for example type WARFARIN SODIUM medication) name and do search. It will list out all the medication which we searched for.

Step 15: Double click to select the medication.

Step 16: Enter the mandatory fields and click save to preserve the data.

Step 17: For adding new medication, Add new medication [fluconazole].

Step 18: Medication selection gives an alert message. View Drug to Drug interaction pops up on screen.

Task 6 Procedure(a9):

Step 1: Open Google Chrome and Enter URL <https://medazdemo.mhealthaz.com> to proceed to the login page. Enter User id and Password. Click Agree checkbox and Login.

Step 2: Select 2-Factor Authentication code delivery option (Email OR Phone code) and enter security code. Security code will be sent to a pre-registered Email address or Phone number, based on your previous selection.

- Step 3: To choose email code from dropdown to select provider.
- Step 4: Choose phone code from select provider dropdown.
- Step 5: Security code will send preauthorized email/phone based on your previous selection.
- Step 6: Select Practice information and facility information in dropdown and proceed to Med A-Z Tiles page.
- Step 7: Select the EHR Tile to proceed to Med A-Z workflow.
- Step 8: After EHR selection, workflow window.
- Step 9: Go to examine patient in Examination dropdown.
- Step 10: Enter appropriate search to find target patient.
- Step 11: Double click the target patient to be examined.
- Step 12: Click patient chart to view detailed information about patient present/previous visits.
- Step 13: Select Chief complaint and look for the red box at the top.
- Step 14: Select click here and review list.
- Step 15: Click all conditions that apply.

Task 7 Procedure(a14):

- Step 1: Open Google Chrome and Enter URL <https://medazdemo.mhealthaz.com> to proceed to the login page. Enter User id and Password. Click Agree checkbox and Login.
- Step 2: Select 2-Factor Authentication code delivery option (Email OR Phone code) and enter security code. Security code will be sent to a pre-registered Email address or Phone number, based on your previous selection.
- Step 3: Select Practice information and facility information in dropdown and proceed to Med A-Z Tiles page.
- Step 4: Select the EHR Tile to proceed to Med A-Z application Flow.
- Step 5: Under the examination menu, select Examine Patient.
- Step 6: Search for target patient. Enter Search term and select appropriate Search By.
- Step 7: Select target patient to be examined. Double click to select.
- Step 8: View Visit information. Click chart to view detailed information about patient visits.
- Step 9: View Patient chart. Select Problem list in left side menu.

Step 10: Click Implantable Device in the left side menu. Click add and enter the UDI search of device list.

Step 11: Enter the UDI Device number, it gives all the information about the lot number, device id, serial number, device published date, manufactured date, brand name and company name, version model number, expiration date.

Task 8 Procedure(b3):

Step 1: Open Google Chrome and Enter URL <https://medazdemo.mhealthaz.com> to proceed to the login page. Enter User id and Password. Click Agree checkbox and Login.

Step 2: Select 2-Factor Authentication code delivery option (Email OR Phone code) and enter security code. Security code will be sent to a pre-registered Email address or Phone number, based on your previous selection.

Step 3: Select Practice information and facility information in dropdown and proceed to Med A-Z Tiles page.

Step 4: Select the EHR Tile to proceed to Med A-Z application Flow.

Step 5: Under the examination menu, select Examine Patient.

Step 6: Search for target patient. Enter Search term and select appropriate Search By.

Step 7: Select target patient to be examined. Double click to select.

Step 8: View Visit information. Click chart to view detailed information about patient visits.

Step 9: View Patient chart. Select Medication Orders from the left side menu.

Step 10: Click the Add New button to enter medication.

Step 11: Enter WARFARIN SODIUM medication and search.

Step 12: Select appropriate drug from lookup by double clicking.

Step 13: View Real Time formulary responses for preferred medications.

Step 14: Click e-prescribe button to send to SureScripts.

Step 15: View confirmation.

APPENDIX 5: SYSTEM USABILITY SCALE QUESTIONNAIRE

In 1996, Brooke published a “low-cost usability scale that can be used for global assessments of systems usability” known as the System Usability Scale or SUS.¹ Lewis and Sauro (2009) and others have elaborated on the SUS over the years. Computation of the SUS score can be found in Brooke’s paper, in at <http://www.usabilitynet.org/trump/documents/Suschapt.doc> or in Tullis and Albert (2008)

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

¹Brooke, J.: SUS: A “quick and dirty” usability scale. In: Jordan, P. W., Thomas, B., Weerdmeester, B. A., McClelland (eds.) Usability Evaluation in Industry pp. 189–194. Taylor & Francis, London, UK (1996). SUS is copyrighted to Digital Equipment Corporation, 1986.