

EHR Usability Test Report of Med-A-Morphosis V3

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

Med-A-Morphosis Version 3

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EXECUTIVE SUMMARY

A usability test of Med-A-Morphosis Version 3 was conducted on 06/26/2017 - 07/15/2017 in Golden, CO by Adrianna Escalante.

The purpose of this test was to test and validate the usability of the current user interface, and provide evidence of usability in the EHR Under Test (EHRUT). During the usability test, 10 intended users matching the target demographic criteria served as participants and used the EHRUT in simulated, but representative tasks.

This study collected performance data on 6 tasks typically conducted on an EHR: entering new patient, medication, implantable device, allergies, diagnosis, and editing patient demographics. During the 90 minute one-on-one usability test. Each participant had prior experience with the EHR.

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 the participant assistance in how to complete the task.

Participants

All participant data was de-identified – no correspondence could be made from the identity of the participant to the data collected. Following the conclusion of the testing, participants were asked to complete a post-test questionnaire and were compensated with varying hourly pay for

their time. 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.

INTRODUCTION

The EHRUT tested for this study was Med-A-Morphosis Version 3. A system designed to present medical information to healthcare providers in in-patient settings, the EHRUT consists of patient data and call data organized in a way that is consistent with a decentralized medical practice. 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 need to complete a task, were captured during the usability testing.

METHOD

PARTICIPANTS

A total of 10 participants were tested on the EHRUT(s). Participants in the test were physician, mid-level, medical assistants, and support staff. Participants were recruited by the test administrator and were 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 all had the same orientation and level of training as actual end users.

Recruited participants had a mix of backgrounds and demographic characteristics. The attached spreadsheet shows a list 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. See attached spreadsheet for details.

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. Each participant used the system in the same location, and was provided with the same instructions. The system was evaluated for

effectiveness, efficiency and satisfaction as defined by measures collected and analyzed for each participant:

- Number of tasks successfully completed within the allotted time without assistance

- Time to complete the tasks

- Number and types of errors

- Path deviations

- Participant's satisfaction ratings of the system

Additional information about the various measures can be found in the attached spreadsheet.

TASKS

Six tasks were constructed that would be realistic and representative of the kinds of activities a user might do with this EHR, including: entering new patient, medication, implantable device, allergies, diagnosis, and editing patient demographics.

PROCEDURES

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. The administrator also 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):

TEST LOCATION

The test facility included a quiet testing room with a desk, computer for the participant, and recording equipment for the administrator. Only the participant and administrator were in the test room. To ensure that the environment was comfortable for users, noise levels were kept to a minimum with the ambient temperature within a normal range.

TEST ENVIRONMENT

The EHRUT would be typically be used in a healthcare office or facility. In this instance, the testing was conducted in a healthcare office. For testing, the computer used a reasonably new computer running Windows or Chrome OS. The participants used a mouse and keyboard when interacting with the EHRUT. The application was set up by Adrianna Escalante according to the vendor's documentation describing the system set-up and preparation. The application itself was running on a remote server using a test database on a LAN connection on Windows and WAN on Chrome OS. Technically, the system performance (i.e., response time) was representative to what actual users would experience in a field implementation. Additionally, participants were instructed not to change any of the default system settings (such as control of font size).

PARTICIPANT INSTRUCTIONS

The administrator reads the following instructions aloud to the each participant:

Thank you for participating in this study. Your input is very important. Our session today will last about 90 minutes. During that time you will use an instance of an electronic health record. I will ask you to complete a 6 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. 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.

Once this task was complete, the administrator gave the following instructions: For each task, I will read the task 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.

Participants were then given 6 tasks to complete. Tasks are outlined in the attached spreadsheet.

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-Morphosis by measuring participant success rates and errors
2. Efficiency of Med-A-Morphosis by measuring the average task time and path deviations
3. Satisfaction with Med-A-Morphosis by measuring ease of use ratings

DATA SCORING

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

Effectiveness:

Task Success

A task was counted as a "Success" if the participant was able to achieve the correct outcome, without assistance, within the time allotted on a per task basis.

Task Failures

If the participant abandoned the task, did not reach the correct answer or performed it incorrectly, or reached the end of the allotted time before successful completion, the task was counted as an "Failures." No task times were taken for errors.

Efficiency:

Task Deviations

The participant's path (i.e., steps) through the application was recorded. Deviations occur if the participant, for example, went to a wrong screen, clicked on an incorrect menu item, followed an incorrect link, or interacted incorrectly with an on-screen control. This path was compared to the optimal path. The number of steps in the observed path is divided by the number of optimal steps to provide a ratio of path deviation.

Task Time

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.

Satisfaction:

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 offer a score based on this scale:

1= strongly disagree, 2= disagree, 3= somewhat agree, 4= agree and 5= strongly agree

To measure participants' confidence in and likability of Med-A-Morphosis overall, the testing team administered the System Usability Scale (SUS) post-test questionnaire. Questions asked:

- 1) I thought the task was easy to use
- 2) I felt very confident using the task
- 3) I would imagine that most people would learn to use this task very quickly

These data are averaged across participants.

Common convention is that average ratings for systems judged easy to use should be 3.3 or above.

RESULTS

DATA ANALYSIS AND REPORTING

Add to Problem List - N=10	
Task Success - Mean (%)	100
Task Success - Standard Deviation (%)	0
Task Path Deviation - Observed #	7
Task Path Deviation - Optimal #	8
Task Time - Mean (seconds)	40
Task Time - Standard Deviation (seconds)	14.6
Task Time Deviation - Mean Observed Seconds	15
Task Time Deviation - Mean Optimal Seconds	22
Task Errors Mean(%)	-0.5
Task Errors - Standard Deviation (%)	0.5
Task Rating - Scale Type	Likert
Task Rating	4.6
Task Rating - Standard Deviation	0.5

Add Implantable Device - N=10	
Task Success - Mean (%)	70
Task Success - Standard Deviation (%)	0.5
Task Path Deviation - Observed #	8

Task Path Deviation - Optimal #	8
Task Time - Mean (seconds)	40
Task Time - Standard Deviation (seconds)	14.6
Task Time Deviation - Mean Observed Seconds	15
Task Time Deviation - Mean Optimal Seconds	22
Task Errors Mean(%)	0.1
Task Errors - Standard Deviation (%)	1.2
Task Rating - Scale Type	Likert
Task Rating	3.5
Task Rating - Standard Deviation	0.5

Add New Patient - N=10	
Task Success - Mean (%)	100
Task Success - Standard Deviation (%)	0
Task Path Deviation - Observed #	6
Task Path Deviation - Optimal #	8
Task Time - Mean (seconds)	40
Task Time - Standard Deviation (seconds)	14.6
Task Time Deviation - Mean Observed Seconds	15
Task Time Deviation - Mean Optimal Seconds	22
Task Errors Mean(%)	-1.8
Task Errors - Standard Deviation (%)	1.9
Task Rating - Scale Type	Likert
Task Rating	4.5
Task Rating - Standard Deviation	0.5

Change Demographics - N=10	
Task Success - Mean (%)	100
Task Success - Standard Deviation (%)	0

Task Path Deviation - Observed #	6
Task Path Deviation - Optimal #	8
Task Time - Mean (seconds)	40
Task Time - Standard Deviation (seconds)	14.6
Task Time Deviation - Mean Observed Seconds	15
Task Time Deviation - Mean Optimal Seconds	22
Task Errors Mean(%)	-1.3
Task Errors - Standard Deviation (%)	1.5
Task Rating - Scale Type	Likert
Task Rating	4.4
Task Rating - Standard Deviation	0.6

Add Change Allergies - N=10	
Task Success - Mean (%)	100
Task Success - Standard Deviation (%)	0
Task Path Deviation - Observed #	9
Task Path Deviation - Optimal #	8
Task Time - Mean (seconds)	40
Task Time - Standard Deviation (seconds)	14.6
Task Time Deviation - Mean Observed Seconds	15
Task Time Deviation - Mean Optimal Seconds	22
Task Errors Mean(%)	1.2
Task Errors - Standard Deviation (%)	1
Task Rating - Scale Type	Likert
Task Rating	4.7
Task Rating - Standard Deviation	0.5

Medication Order - N=10	
Task Success - Mean (%)	100

Task Success - Standard Deviation (%)	0
Task Path Deviation - Observed #	8
Task Path Deviation - Optimal #	8
Task Time - Mean (seconds)	42
Task Time - Standard Deviation (seconds)	21.1
Task Time Deviation - Mean Observed Seconds	16
Task Time Deviation - Mean Optimal Seconds	22
Task Errors Mean(%)	0.6
Task Errors - Standard Deviation (%)	4.7
Task Rating - Scale Type	Likert
Task Rating	4.5
Task Rating - Standard Deviation	0.5

DISCUSSION OF THE FINDINGS

EFFECTIVENESS

Each of the participants were able to complete each of the six tasks.

EFFICIENCY

Efficiency was lowest in adding implantable devices. This is a feature that is used less frequently amongst the study participants so the lack of familiarity may have played a part in the decreased efficiency.

SATISFACTION

Overall Med-A-Morphosis scored well with respect to satisfaction on each of the tasks. The lowest score was 3.5 for the task of adding an implantable device.

MAJOR FINDINGS

Overall Med-A-Morphosis is an effective, efficient, and easy to use system. Ease of use is evident in the overall satisfaction on the six tasks performed. The lowest Likert score was a 3.5 which is higher than 3.3 which by common convention is that average ratings for systems judged easy to use. There may be other aspects of the system that were not covered in this study that may have lower scores but for the purposes of the six tasks performed for this study overall satisfaction average was 4.4.

AREAS FOR IMPROVEMENT

The implantable device entry can be made easier and will likely result in higher satisfaction scores as well as higher efficiency.