Customized Common Industry Format Template for Electronic Health Record Usability Testing

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15-Nov-10
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INTENDED AUDIENCE
This document provides a template for the modified version of Software engineering — Software product Quality Requirements and Evaluation (SQuaRE) — Common Industry Format (CIF) for usability test reports (ISO/IEC 25062:2006(E)), the Common Industry Format (CIF) usability test report. This version of the CIF has been customized for use in usability testing of Electronic Health Records (EHRs) by usability administrator(s) and data logger(s). The template enables usability engineers to effectively communicate the results of EHR usability testing.

INTENDED PURPOSE
The intention of the CIF is to help vendors demonstrate evidence of usability in their final product in a format that allows both independent evaluation of a single product and comparison across multiple products. This document has been prepared as a template to guide EHR usability test administrators meet the usability processes approach put forth by the National Institute of Standards and Technology (NIST). The following customized CIF template is intended to assist EHR vendors, healthcare providers, and researchers in reporting the results of usability testing for each system tested.

USING THIS DOCUMENT
This document is not intended to be a tutorial on usability or usability testing. To work with this document you should have expertise with common usability industry practices.

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and with standard ISO/IEC 25062:2006.\textsuperscript{2} The ISO document is intended for the reporting
of summative (i.e., quantitative) studies. The modifications here allow for the reporting of
qualitative findings (i.e., formative) but strongly recommend and encourage the collection
of quantitative measures of user performance.

Reports delivered using this template should conform to the major headings and content
areas outlined below. Minor deviations from the outline and format are acceptable, but
the reports should follow the template in all material aspects. This template includes the
following sections:\textsuperscript{3}

- Executive Summary
- Introduction
- Method
- Results
- Appendices

In addition to these sections, the modified CIF must also include a title page; a sample
title page is included in the template example.

When completing the modified CIF template, it is highly recommended that EHR usability
test administrator(s) and their data logger(s) refer to the instructions and guidance in
order to properly complete this template.

The sample data provided in this template is an example or placeholder of the types of
content that may be useful in completing the modified CIF template. Gray background
text (bounded in square brackets) needs to be replaced by the EHRs’ supplied
information. It is important to note that this sample content is not to be taken literally or
as a starting point.

\textsuperscript{2} This document can be purchased from:

\textsuperscript{3} Each of these sections has a corresponding section in the ISO/IEC 25062.
EHR Usability Test Report of StreamlineMD, Version 14


StreamlineMD, Version 14

Date of Usability Test: April 3rd and 4th, 2014
Date of Report: April 7th, 2014
Report Prepared By: StreamlineMD, LLC a PRC Medical Company
Smitesh S. Shah, Director, Product Management, 732-658-9062
ssah@prcmedical.com
3333 S. Arilington, Road, Akron, OH 44312

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15-Nov-10
EXECUTIVE SUMMARY

A usability test of StreamlineMD, Version 14 was conducted on April 4th and 5th, 2014 via Go To Meeting by StreamlineMD Implementation Team.

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, 1 healthcare provider, 1 Nurse and 5 Medical Assistants matching the target demographic criteria served as participants and used the EHRUT in simulated, but representative tasks.

This study collected performance data on 9 tasks typically conducted on an EHR:

1. Computerized Order Entry System (Lab)
2. Computerized Order Entry System (Diagnostic)
3. Drug-Drug/Drug-Allergy Interaction Check
4. Medication List (Current Medications)
5. Allergy List
6. Clinical Decision Support
7. Prescriptions
8. Electronic Prescribing
9. Clinical Information Reconciliation

During the six one-on-one usability tests, 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. Participants had prior experience with the EHR.4

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.

4 If training or help materials were provided, describe the nature of it. The recommendation is that all participants be given the opportunity to complete training similar to what a real end user would receive prior to participating in the usability test.
Participant screens, and audio were recorded for subsequent analysis.

The following types of data were collected for each participant:

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

All participant data was de-identified – no correspondence could be made from the identity of the participant to the data collected. Following the conclusion of the testing, participants were asked to complete a post-test questionnaire and were not compensated 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.
<table>
<thead>
<tr>
<th>Measure Task</th>
<th>N #</th>
<th>Allocated time per task</th>
<th>Task Success</th>
<th>Path Deviation</th>
<th>Task Time</th>
<th>Errors</th>
<th>Task Ratings 1=very easy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Session</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9.8 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. First Impression</td>
<td>6</td>
<td>30 sec</td>
<td>100%</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Allergies</td>
<td>6</td>
<td>30 sec</td>
<td>100%</td>
<td>0</td>
<td>18.7 sec</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3. Current Med</td>
<td>6</td>
<td>45 sec</td>
<td>100%</td>
<td>0</td>
<td>21.2 sec</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4. Prescription</td>
<td>6</td>
<td>60 sec</td>
<td>100%</td>
<td>0</td>
<td>40.5 sec</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5. Interactions</td>
<td>6</td>
<td>30 sec</td>
<td>100%</td>
<td>0</td>
<td>9 sec</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6. Electronic prescribing</td>
<td>6</td>
<td>30 sec</td>
<td>100%</td>
<td>0</td>
<td>9.5 sec</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>*Total prescription Time</td>
<td>6</td>
<td>120 sec</td>
<td>100%</td>
<td>0</td>
<td>59 sec</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>7. Diagnostic Order</td>
<td>6</td>
<td>45 sec</td>
<td>100%</td>
<td>0</td>
<td>24.3 sec</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>8. Lab Order</td>
<td>6</td>
<td>45 sec</td>
<td>100%</td>
<td>0</td>
<td>25.3 sec</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>9. CDS</td>
<td>6</td>
<td>45 sec</td>
<td>100%</td>
<td>0</td>
<td>24.1 sec</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10. Clinical Reconciliation</td>
<td>6</td>
<td>120 sec</td>
<td>100%</td>
<td>0</td>
<td>68.5 sec</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

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

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

- Major findings
  - None
- Areas for improvement
  - None

---

INTRODUCTION

The EHRUT tested for this study was StreamlineMD, Version 14. Designed to present medical information to healthcare providers in doctor’s offices the EHRUT consists of an Electronic Health Record that is used for ambulatory outpatient 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 usability in the EHR Under Test (EHRUT). To this end, measures of effectiveness, efficiency and user satisfaction, such as time on task and ease of completing task and ease of navigation, were captured during the usability testing.

METHOD

PARTICIPANTS

A total of 6 participants were tested on the EHRUT(s). Participants in the test were Medical Assistants, Nurses, and Doctors. Participants were recruited by the StreamlineMD Implementation Team and were not compensated for their time. In addition, participants had no direct connection to the development of or organization producing the EHRUT(s). Participants were not from the testing or supplier organization. Participants were given the opportunity to have the same orientation and level of training as the actual end users would have received.

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.

<table>
<thead>
<tr>
<th>Participant ID</th>
<th>Gender</th>
<th>Age</th>
<th>Education</th>
<th>Occupation Role</th>
<th>Professional Experience</th>
<th>Computer Experience</th>
<th>Product Experience</th>
<th>Assistive Technology Needs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F</td>
<td>37</td>
<td>MD</td>
<td>MD</td>
<td>10 years</td>
<td>5.5 years</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>F</td>
<td>23</td>
<td>some college</td>
<td>Clinical Staff Manager</td>
<td>4 years</td>
<td>4 years</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>F</td>
<td>25</td>
<td>some college</td>
<td>MA</td>
<td>8 years</td>
<td>9 months</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>F</td>
<td>21</td>
<td>some college</td>
<td>MA</td>
<td>3 Years</td>
<td>6 months</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>23</td>
<td>some college</td>
<td>MA</td>
<td>1.5 years</td>
<td>1.5 years</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>F</td>
<td>22</td>
<td>some college</td>
<td>MA</td>
<td>3.5 years</td>
<td>3.5 years</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

Six participants (matching the demographics in the section on Participants) were recruited and 6 participants participated in the usability test. Zero participants failed to show for the study.

Participants were scheduled 45 minute sessions with 15 minutes in between each session for debrief by the administrator(s) and data logger(s), and to reset systems to proper test conditions. A spreadsheet was used to keep track of the participant schedule, and included each participant’s demographic characteristics as provided by the recruiting firm.

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 one 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 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

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

1. Computerized Order Entry System (Labs)
2. Computerized Order Entry System (Diagnostic)
3. Drug-Drug /Drug-Allergy Interaction Check
4. Medication List (Current Medications)
5. Allergy List
6. Clinical Decision Support
7. Prescriptions
8. Electronic Prescribing
9. Clinical Information Reconciliation

Tasks were selected based on their frequency of use, criticality of function, and those that may be most troublesome for users.6Tasks should always be constructed in light of the study objectives.

PROCEDURES
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 on the StreamlineMD implementation team with a combined 12 years of implementation experience along with college education backgrounds.

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.

---

6 Constructing appropriate tasks is of critical importance to the validity of a usability test. These are the actual functions, but most tasks contain larger and more fleshed out context that aligns with the sample data sets available in the tested EHR. Please consult usability references for guidance on how to construct appropriate tasks.

7 All participant data must be de-identified and kept confidential.
• 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.

Following the session, the administrator gave the participant the post-test questionnaire (e.g., the System Usability Scale, see Appendix 5), compensated them for their time, and thanked each individual for their participation.

Participants' demographic information, task success rate, time on task, errors, deviations, verbal responses, and post-test questionnaire were recorded into a spreadsheet.

Participants were thanked for their time and compensated. Participants signed a receipt and acknowledgement form (See Appendix 6) indicating that they had received the compensation.

TEST LOCATION

The test facility included a waiting area and a quiet testing room with a table, computer for the participant, and recording computer for the administrator. Only the participant and administrator were in the test room. All observers and the data logger worked from a separate room where they could see the participant’s screen and face shot, and listen to
the audio of the session. To ensure that the environment was comfortable for users, noise
levels were kept to a minimum with the ambient temperature within a normal range. All of the
safety instruction and evacuation procedures were valid, in place, and visible to the
participants.

TEST ENVIRONMENT

The EHRUT would be typically be used in a healthcare office or facility.

In this instance, the testing was conducted via a Go To Meeting. For testing, the computer used was a
HP6200 Desktop computer running Windows 7 Professional on user’s computer who then logged in to
Remote Desktop Connection to log into StreamlineMD EHR servers running Windows 2008 R2
Operating System.

The participants used a keyboard and mouse when interacting with the EHRUT.

The [EHRUT] used a 21 inch monitor with a screen resolution of 1600 x 900.

The application was set up by the implementation specialist according to the vendor’s documentation
describing the system set-up and preparation. The application itself was running on a Windows 2008 R2
using MicrosoftTerminal Servers using test database on LAN connection.

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).

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 3-6 respectively. The
moderator’s Guide was devised so as to be able 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. A web camera was not used to record each participant’s facial
expressions as the users did not have this technology available to them, and verbal comments were
recorded with a microphone. The test session was electronically transmitted to a nearby observation room where the data logger observed the test session.

PARTICIPANT INSTRUCTIONS

The administrator reads the following instructions aloud to the each participant (also see the full moderator’s guide in Appendix [B4]):

Thank you for participating in this study. Your input is very important. Our session today will last about 30 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 (1 minute) 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.\(^9\)

I will ask you your impressions about the task once you are done.

Participants were then given 9 tasks to complete. Tasks are listed in the moderator’s guide in Appendix [B4].

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 StreamlineMD EHR, Version 14.0 by measuring participant success rates and errors
2. Efficiency of StreamlineMD EHR, Version 14.0\(^1\) by measuring the average task time and path deviations

\(^9\) Participants should not use a think-aloud protocol during the testing. Excessive verbalization or attempts to converse with the moderator during task performance should be strongly discouraged. Participants will naturally provide commentary, but they should do so, ideally, after the testing. Some verbal commentary may be acceptable between tasks, but again should be minimized by the moderator.
3. Satisfaction with StreamlineMD EHR, Version 14.0 by measuring ease of use ratings

DATA SCORING

The following table (Table [x]) details how tasks were scored, errors evaluated, and the time data analyzed.\(^{10}\)

<table>
<thead>
<tr>
<th>Measures</th>
<th>Rationale and Scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Effectiveness:</strong></td>
<td></td>
</tr>
<tr>
<td>Task Success</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>The total number of successes were calculated for each task and then divided by the total number of times that task was attempted. The results are provided as a percentage.</td>
</tr>
<tr>
<td></td>
<td>Task times were recorded for successes. Observed task times divided by the optimal time for each task is a measure of optimal efficiency.</td>
</tr>
<tr>
<td></td>
<td>Optimal task performance time, as benchmarked by expert performance under realistic conditions, is recorded when constructing tasks. Target task times used for task times in the Moderator’s Guide must be operationally defined by taking multiple measures of optimal performance and multiplying by some factor [e.g., 1.25] that allows some time buffer because the participants are presumably not trained to expert performance. Thus, if expert, optimal performance on a task was ([x]) seconds then allotted task time performance was ([x \times 1.25]) seconds. This ratio should be aggregated across tasks and reported with mean and variance scores.</td>
</tr>
<tr>
<td><strong>Effectiveness:</strong></td>
<td></td>
</tr>
<tr>
<td>Task Failures</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>The total number of errors was calculated for each task and then divided by the total number of times that task was attempted. Not all deviations would be counted as errors.(^{11}) This should also be expressed as the mean number of failed tasks per participant.</td>
</tr>
<tr>
<td></td>
<td>On a qualitative level, an enumeration of errors and error types should be collected.</td>
</tr>
<tr>
<td><strong>Efficiency:</strong></td>
<td></td>
</tr>
<tr>
<td>Task Deviations</td>
<td>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.</td>
</tr>
</tbody>
</table>


\(^{11}\) Errors have to be operationally defined by the test team prior to testing.
It is strongly recommended that task deviations be reported. Optimal paths (i.e., procedural steps) should be recorded when constructing tasks.

**Efficiency:**

**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:**

**Task Rating**

Participant’s subjective impression of the ease of use of the application was measured by administering both a simple post-task question as well as a post-session questionnaire. After each task, the participant was asked to rate "Overall, this task was:" on a scale of 1 (Very Difficult) to 5 (Very Easy). These data are averaged across participants.

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

To measure participants' confidence in and likeability of the [StreamlineMD EHR; Version 14.0] overall, the testing team administered the System Usability Scale (SUS) post-test questionnaire. Questions included, "I think I would like to use this system frequently," "I thought the system was easy to use," and "I would imagine that most people would learn to use this system very quickly." See full System Usability Score questionnaire in Appendix 5.

Table [x]. Details of how observed data were scored.

**RESULTS**

**DATA ANALYSIS AND REPORTING**

The results of the usability test were calculated according to the methods specified in the Usability Metrics section above. Participants who failed to follow session and task instructions had their data excluded from the analyses. There were no data exclusions. There were no testing irregularities or issues relative benchmark that is used against other iterations of the system. that affected data collection or interpretation of the results.

The usability testing results for the EHRUT are detailed below (see Table [x]). The results should be seen in light of 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. Furthermore, the data should be presented in forms such as the table below so that the tasks can be easily identified and their performance results examined and compared.

---

12 See Tedesco and Tullis (2006) for a comparison of post-task ratings for usability tests.

in usability testing. *Usability Professionals association Conference, June 12 – 16, Broomfield, CO.*

13 The SUS survey yields a single number that represents a composite measure of the overall perceived usability of the system. SUS scores have a range of 0 to 100.

<table>
<thead>
<tr>
<th>Measure Task</th>
<th>N #</th>
<th>Allocate d time per task</th>
<th>Task Success</th>
<th>Path Deviation</th>
<th>Task Time</th>
<th>Deviation s Observed/Optimal</th>
<th>Errors</th>
<th>Task Ratings 1=very easy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Session</td>
<td></td>
<td></td>
<td>Mean SD</td>
<td>Deviations Observed/Optimal</td>
<td>Mean SD</td>
<td>9.8 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. First Impression</td>
<td>6</td>
<td>30 sec</td>
<td>100%</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Allergies</td>
<td>6</td>
<td>30 sec</td>
<td>100%</td>
<td>0</td>
<td>18.7 sec</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>3. Current Med</td>
<td>6</td>
<td>45 sec</td>
<td>100%</td>
<td>0</td>
<td>21.2 sec</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>4. Prescription</td>
<td>6</td>
<td>60 sec</td>
<td>100%</td>
<td>0</td>
<td>40.5 sec</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>5. Interactions</td>
<td>6</td>
<td>30 sec</td>
<td>100%</td>
<td>0</td>
<td>9 sec</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>6. Electronic prescribing</td>
<td>6</td>
<td>30 sec</td>
<td>100%</td>
<td>0</td>
<td>9.5 sec</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><em>Total prescription Time</em></td>
<td>6</td>
<td>120 sec</td>
<td>100%</td>
<td>0</td>
<td>59 sec</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>7. Diagnostic Order</td>
<td>6</td>
<td>45 sec</td>
<td>100%</td>
<td>0</td>
<td>24.3 sec</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>8. Lab Order</td>
<td>6</td>
<td>45 sec</td>
<td>100%</td>
<td>0</td>
<td>25.3 sec</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>9. CDS</td>
<td>6</td>
<td>45 sec</td>
<td>100%</td>
<td>0</td>
<td>24.1 sec</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>10. Clinical Reconciliation</td>
<td>6</td>
<td>120 sec</td>
<td>100%</td>
<td>0</td>
<td>68.5 sec</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

The results from the SUS (System Usability Scale) scored the subjective satisfaction with the system based on performance with these tasks to be: 100. Broadly interpreted, scores under 60 represent systems with poor usability; scores over 80 would be considered above average.

**DISCUSSION OF THE FINDINGS**

The results of all the users where reviewed, discussed and analyzed. All the provided tasks where completed in less than the stipulated time. Each task was closely monitored while being performed by user to ensure that none of the task were difficult for the users to perform. Upon discussion there were no major findings noted and the overall user rating and satisfaction level was extremely high.

15-Nov-10
EFFECTIVENESS

StreamlineMD EHR’s effectiveness is measured in terms of percentage of all participants being able to accomplish tasks (success rate), the percentage of tasks achieved per unit of time (allocated time), and the path or manner in which the tasks were achieved.

StreamlineMD EHR scores extremely high on effectiveness as all participants were able to attempt all the tasks and complete them with success in less than the allocated time per task. There has been no path deviation signifying the intuitiveness and ease of use of the system.

EFFICIENCY

StreamlineMD EHR measured efficiency based on amount of time taken by allocated per task against the time taken to complete individual tasks by participants.

All the participants were able to complete all the tasks efficiently within the expected duration with no task time deviation.

SATISFACTION

All the participants were extremely satisfied with the system. The System Usability Score (SUS) was 100 which was maximum. All the users rated all tasks as “easy” to attempt and did not seem to need any help nor seeking any answers. The open-ended questions at the end revealed that all participants liked one or more features of StreamlineMD EHR. Based on task ratings and SUS results data all our users are extremely satisfied with StreamlineMD EHR software functions and the overall application.

MAJOR FINDINGS

Based on the quantitative findings, verbal report of the participants and observations from the administrators and data loggers there were no major findings noted and there was no deviation from task.

AREAS FOR IMPROVEMENT

Based on the quantitative findings, verbal report of the participants and observations from the administrators and data loggers there were no major areas for improvements noted.
APPENDICES

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

1: Sample Recruiting screener

2: Participant demographics

3: Non-Disclosure Agreement (NDA) and Informed Consent Form

4: Example Moderator’s Guide

5: System Usability Scale Questionnaire

It is important to note that these Appendices are examples only. They are not intended to be used exactly as rendered below.

For example, the intended users of the system will determine sampling requirements which drive screener questions. Likewise, the goals of the study will determine the exact tasks and data to be recorded; this will create the tasks and data collection plan in the moderator’s guide.

See some of the previously cited references for examples of these documents.
Appendix 1: SAMPLE RECRUITING SCREENER

The purpose of a screener to ensure that the participants selected represent the target user population as closely as possible. (Portions of this sample screener are taken from www.usability.gov/templates/index.html#Usability and adapted for use.)

Recruiting Script for Recruiting Firm

Hello,

My name is Dawn Jordan, an implementation specialist calling from StreamlineMD. We are recruiting individuals to participate in a usability study for StreamlineMD EHR, Version 14.0 an electronic health record. We would like to ask you a few questions to see if you qualify and if 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 not be compensated 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. Have you participated in a focus group or usability test in the past 12 months?
2. Do you, or does anyone in your home, work in marketing research, usability research, web design […] etc.]
3. Do you, or does anyone in your home, have a commercial or research interest in an electronic health record software or consulting company?
4. Which of the following best describes your age? [23 to 39; 40 to 59; 60 - to 74; 75 and older]
5. Which of the following best describes your race or ethnic group? [e.g., Caucasian, Asian, Black/African-American, Latino/a or Hispanic, etc.]
6. 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/Medical Assistant: ________________
   - Physician: Specialty ________________
   - Resident: Specialty ________________
   - Administrative Staff
9. How long have you held this position?
10. Describe your work location (or affiliation) and environment?
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.]
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?
   - [ ] On paper
   - [ ] Some paper, some electronic
   - [ ] All electronic

**Contact Information**

Those are all the questions I have for you. Your background matches the people we’re looking for. For your participation, you will not be compensated.

Would you be able to participate on April 3rd at 2:00 p.m.?

**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 at your clinic via a Go To Meeting. I will confirm your appointment a couple of days before your session and provide you with directions and an invitation to connect to the Go To Meeting. What time is the best time to reach you?
Appendix 2: PARTICIPANT DEMOGRAPHICS

The report should contain a breakdown of the key participant demographics. A representative list is shown below.

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

<table>
<thead>
<tr>
<th>Gender</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>[0]</td>
</tr>
<tr>
<td>Women</td>
<td>[6]</td>
</tr>
<tr>
<td>Total (participants)</td>
<td>[6]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Occupation/Role</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>RN/BSN</td>
<td>[1]</td>
</tr>
<tr>
<td>Physician</td>
<td>[1]</td>
</tr>
<tr>
<td>Medica Staff</td>
<td>[4]</td>
</tr>
<tr>
<td>Total (participants)</td>
<td>[6]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Years of Experience</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Years experience</td>
<td>[X]</td>
</tr>
<tr>
<td>Facility Use of EHR</td>
<td></td>
</tr>
<tr>
<td>All paper</td>
<td>[X]</td>
</tr>
<tr>
<td>Some paper, some</td>
<td>[X]</td>
</tr>
<tr>
<td>electronic</td>
<td></td>
</tr>
<tr>
<td>All electronic</td>
<td>[X]</td>
</tr>
<tr>
<td>Total (participants)</td>
<td>[X]</td>
</tr>
</tbody>
</table>

As an appendix to the report, the full participant breakdown (de-identified) should be included.
Appendix 3: NON-DISCLOSURE AGREEMENT AND INFORMED CONSENT FORM

Appendix 4: EXAMPLE MODERATOR’S GUIDE

Only three tasks are presented here for illustration.

**EHRUT Usability Test**

**Moderator’s Guide**

Administrator _______________________

Data Logger _______________________

Date ____________________________  Time __________

Participant # ________

Location ___________________________

Prior to testing

- Confirm schedule with Participants
- Ensure EHRUT lab environment is running properly
- Ensure lab and data recording equipment is running properly

Prior to each participant:

- Reset application
- Start session recordings with tool

Prior to each task:

- Reset application to starting point for next task

After each participant:

- End session recordings with tool

After all testing:

- Back up all video and data files
**Orientation (X minutes)**

Thank you for participating in this study. Our session today will last **XX 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 (X 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: First Impressions (XXX Seconds)**

This is the application you will be working with. Have you heard of it?  

---

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

If so, tell me what you know about it.

- *Show test participant the EHRUT.*
- *
  - Please don’t click on anything just yet. What do you notice? What are you able to do here? Please be specific.

*Notes / Comments:*
Task 2: Patient Summary Screen (XXX Seconds)

Take the participant to the starting point for the task.

Before going into the exam room and you want to review Patient’s chief complaint, history, and vitals. Find this information.

Success:
- Easily completed
- Completed with difficulty or help :: Describe below
- Not completed

Comments:

Task Time: _______ Seconds

Optimal Path: Screen A → Screen B → Drop Down B → “OK” Button → Screen X...

- Correct
- Minor Deviations / Cycles :: Describe below
- Major Deviations :: Describe below

Comments:

Observed Errors and Verbalizations:

Comments:

Rating:

Overall, this task was: _______

Show participant written scale: “Very Easy” (1) to “Very Difficult” (5)

Administrator / Notetaker Comments:
Task 3: Find Lab Results (XXX Seconds)

Take the participant to the starting point for the task.

On her last visit, you sent Patient to get a colonoscopy. Locate these results and review the notes from the specialist.

Success:

- [ ] Easily completed
- [ ] Completed with difficulty or help :: Describe below
- [ ] Not completed

Comments:

Task Time: _______ Seconds

Optimal Path: Screen A → Screen B → Drop Down B1 → “OK” Button → Screen X...

- [ ] Correct
- [ ] Minor Deviations / Cycles :: Describe below
- [ ] Major Deviations :: Describe below

Comments:

Observed Errors and Verbalizations:

Comments:

Rating:

Overall, this task was: _______

Show participant written scale: “Very Easy” (1) to “Very Difficult” (5)

Administrator / Notetaker Comments:

______________________________

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**Task 4: Prescribe medication (XXX Seconds)**

Take the participant to the starting point for the task. Ensure that this patient has a drug-drug and a drug-food allergy to the drug chosen. This will put force the participant to find other drugs and use other elements of the application.

After examining Patient, you have decided to put this patient on a statin – drug name. Check for any interactions and place an order for this medication.

Success:
- ☐ Easily completed
- ☐ Completed with difficulty or help :: Describe below
- ☐ Not completed

*Comments:*

**Task Time:** _______ Seconds

**Optimal Path:** Screen A → Screen B → Drop Down B↑ → “OK” Button → Screen X...

- ☐ Correct
- ☐ Minor Deviations / Cycles :: Describe below
- ☐ Major Deviations :: Describe below

*Comments:

**Observed Errors and Verbalizations:**

*Comments:*

**Rating:**

- Overall, this task was: _______

  Show participant written scale: “Very Easy” (1) to “Very Difficult” (5)

**Administrator / Notetaker Comments:**
Final Questions (X Minutes)

What was your overall impression of this system?

What aspects of the system did you like most?

What aspects of the system did you like least?

Were there any features that you were surprised to see?

What features did you expect to encounter but did not see? That is, is there anything that is missing in this application?

Compare this system to other systems you have used.

Would you recommend this system to your colleagues?

Administer the SUS
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. 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).

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

2. I found the system unnecessarily complex

3. I thought the system was easy to use

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

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

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

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

8. I found the system very cumbersome to use

9. I felt very confident using the system

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

Appendix 6: INCENTIVE RECEIPT AND ACKNOWLEDGMENT FORM


Acknowledgement of Receipt

I hereby acknowledge receipt of $_____ for my participation in a research study run by Test Company.

Printed Name: ____________________________________________________________

Address: ________________________________________________________________

__________________________________________

Signature: _______________ Date: _______________

Usability Researcher: __________________________

Signature of Usability Researcher: __________________

Date: _______________

Witness: __________________________

Witness Signature: __________________________

Date: _______________