NISTIR 7742

Customized Common Industry Format Template for Electronic Health Record Usability Testing

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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.[1]   To work

with this document you should have expertise with common usability industry practices

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[1] Excellent starting points for information are www.usability.gov and www.upassoc.org as well as Dumas, J., Redish, J. (1994) *A Practical Guide to Usability Testing.* Norwood, NJ: Ablex. Dana Chisnell & Jeffrey Rubin *Handbook of Usability Testing: How to Plan, Design, and Conduct*

and with standard ISO/IEC 25062:2006.[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:[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.

Effective Tests (2nd ed.) Wiley, 2008.
Schumacher (2009). *Handbook of Global User Research.* Burlington, MA: Morgan Kaufman.

[2] This document can be purchased from:
http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=43046.
[3] Each of these sections has a corresponding section in the ISO/IEC 25062.

EHR Usability Test Report of Oberd 1.3.1

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

Oberd 1.3.1

Date of Usability Test: 11/12/18
Date of Report.   11/12/18
Report Prepared By: In-House
                           Andrea Wood, CAO
                           573-442-7101
                           andrea@oberd.com
                           414 E. Broadway Ste 102
                           Columbia, MO 65203

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EXECUTIVE SUMMARY

A usability test of Oberd version 1.3.1 modular EMR was

conducted on 11/12/2018 in Columbia, MO by Oberd. 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 healthcare providers and other 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 [A.5.1, A.5.2, A.5.3, A.6.1 A.6.2 A.6.3 A.7.1 A.7.2 A.7.3 A.8.1 A.8.2 A.8.3 A.9.1] tasks typically conducted

on an EHR:

- Enable the user to record the preferred language DOB sex, race, ethnicity, sexual orientation, gender identity
- Enable user to change preferred language DOB sex, race, ethnicity, sexual orientation, gender identity
- Enable user the access to preferred language DOB sex, race, ethnicity, sexual orientation, gender identity
- Enable user to record a problem to the problem list
- Enable user to change a problem on the problem list
- Enable user access and display the active problem list
- Enable user to record a medication to the medication list
- Enable user to change a medication on the medication list
- Enable user access and display the active medication list
- Enable user to record a medication allergy to the medication allergy list
- Enable user to change a medication allergy on the medication allergy list
- Enable user to access and display the active medication allergy list
- Enable user to access and display the active implantable device list

During the 10 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. Participants had and some

did not have 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.

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[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, 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 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 0$
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.

Measure Task	N	Task Success	Path Deviation		Task Time		Errors	Task Rating
	#	MEAN (SD)	Deviation (Observed/Optimal)	Mean(SD)	Deviation (Observed/Optimal)		Mean (SD)	Mean (SD)
A.5.1	10	0	1 / 7	53	2 / 30		4	5
A.5.2	10	0	1 / 6	19	10 / 2		2	5
A.5.3	10	0	1 /4	15	7 / 2		3	5
A.6.1	10	0	1 / 7	31	2 / 15		3	4.5
A.6.2	10	0	1 / 4	13	1 / 10		3	4.5
A.6.3	10	0	1 / 2	2	1 / 2		5	4.5
A.7.1	10	0	1 /7	26	1 / 20		3	4.5

A.7.2	10	0	1 / 4	17	2 / 10	0	4.5
A.7.2	10	0	1 / 2	3	1 / 2	0	4.5
A.8.1	10	0	1 / 7	11	2 / 5	0	4.5
A.8.2	10	0	1 / 4	8	4 / 2	3	4.5
A.8.3	10	0	1 / 2	4	0 / 10	5	4.5
A.9.1	10	0	1 / 7	53	2 / 30	4	5

The results from the System Usability Scale scored the subjective

satisfaction with the system based on performance with these tasks to

be: 4.6 out of 5 points.[5]

In addition to the performance data, the following qualitative observations

were made:

- Major findings

    o System was easy to use, for those who had never used the system before quickly understood how to operate the system.

- Areas for improvement

    o Having a drop down for previously searched patients.

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[5] See Tullis, T. & Albert, W. (2008). Measuring the User Experience. Burlington, MA: Morgan Kaufman (p. 149). Broadly interpreted, scores under 60 represent systems with poor usability; scores over 80 would be considered above average.

INTRODUCTION

The EHRUT tested for this study was Oberd version 1.3.1. Designed to present medical information to healthcare

providers in Orthopedic Practice, Clinical Setting the EHRUT consists of

Web-based Patient Reported Outcomes Platform. 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 The time to complete each of the steps was under a minute for provider and staff that have had some experience with the Oberd along with those who have had no experience with the Oberd, were captured during the usability testing.

METHOD

PARTICIPANTS

A total of 10 participants were tested on the EHRUT(s). Participants in

the test was Orthopedists . Participants were recruited

by Columbia Orthopaedics and were compensated 0$
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.

	Part ID	Gender	Age	Education	Occu pation /role	Professional Experience	Computer experience	Product Experience	Assistive Technology Needs
	1	Female	20-29	Masters	Medical	120	120	0	No
	2	Female	40-49	Bachelors	Nurse	300	300	0	No
	3	Male	20-29	Doctorate	PA	96	96	0	No
	4	Male	40-49	Masters	Admin	240	240	0	No
	5	Female	20-29	Bachelors	Nurse	60	60	0	No
	6	Female	20-29	Associates	Admin	36	36	0	No
	7	Female	40-49	Trade	Xray Tech	252	252	0	No
	8	Male	20-29	Doctorates	MD	144	144	0	No
	9	Male	70-79	Doctorate	MD	240	240	0	No
	10	Male	40-49	Bachelors	NP	36	36	0	No

10 participants (matching the demographics in the section on Participants) were recruited and 10 participated in the usability

test. 0 participants failed to show for

the study.

Participants were scheduled for 10-minute sessions with

5 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 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 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. Enable the user to record the preferred language DOB sex, race, ethnicity, sexual orientation, gender identity
2. Enable user to change preferred language DOB sex, race, ethnicity, sexual orientation, gender identity
3. Enable user the access to preferred language DOB sex, race, ethnicity, sexual orientation, gender identity
4. Enable user to record a problem to the problem list

5. Enable user to change a problem on the problem list
6. Enable user access and display the active problem list
7. Enable user to record a medication to the medication list
8. Enable user to change a medication on the medication list
9. Enable user access and display the active medication list
10. Enable user to record a medication allergy to the medication allergy list
11. Enable user to change a medication allergy on the medication allergy list
12. Enable user to access and display the active medication allergy list
13. Enable user to access and display the active implantable device list

Tasks were selected based on their frequency of use, criticality of

function, and those that may be most troublesome for users.[6] Tasks

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.[7] 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

with 10 year's experience, background in Health IT, Masters in Mass
Communications.
The data logger has 10 years in the medical field, MBA/MHA and has worked with
multiple EMRs and participated previously in usability tests for previous
organizations.

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.

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[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 in a conference room and the
orthopaedic practice. For

testing, the computer used an iPad running Oberd.

The participants used a touch screen.

when interacting with the EHRUT.

Oberd] used iPad Air 2, 9.7 inch screen, resolution 1536x2048, the software does not
have a print option. The application was set up by the CAO, according to the
vendor's documentation describing the

system set-up and preparation. The application itself was running on a

web-based using a test environment on a WAN 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

4. Incentive Receipt and Acknowledgment Form

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 recorded each participant's facial expressions synced

with the screen capture, and verbal comments were recorded

with a microphone. [8] 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 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 10 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*

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[8] There are a variety of tools that record screens and transmit those recordings across a local area network for remote observations.

> *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 (5 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. [9] I will ask you your impressions about the task once you are done.*

Participants were then given 13 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 Oberd by measuring participant success rates and errors
2. Efficiency of Oberd 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 Oberd 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]

Measures	Rationale and Scoring
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. 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. 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 [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 * 1.25] seconds. This ratio should be aggregated across tasks and reported with mean and variance scores.
Effectiveness: 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. 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. On a qualitative level, an enumeration of errors and error types should be collected.
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.

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[10] An excellent resource is Tullis, T. & Albert, W. (2008). Measuring the User Experience. Burlington, MA: Morgan Kaufman. Also see www.measuringusability.com
[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. [12] 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 [EHRUT] 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. [13]

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 No Data Exclusions. No Testing Irregularities/Issues

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[12] See Tedesco and Tullis (2006) for a comparison of post-task ratings for usability tests. Tedesco, D. & Tullis, T. (2006) A comparison of methods for eliciting post-task subjective ratings 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 and the score is a relative benchmark that is used against other iterations of the system.

The usability testing results for the EHRUT are detailed below (see Table [x])[14]. 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.]

Measure Task	N	Task Success	Path Deviation		Task Time		Errors	Task Rating
	#	MEAN (SD)	Deviation (Observed/Optimal)	Mean(SD)	Deviation (Observed/Optimal)		Mean (SD)	Mean (SD)
A.5.1	10	0	1 / 7	53	2 / 30		4	5
A.5.2	10	0	1 / 6	19	10 / 2		2	5
A.5.3	10	0	1 /4	15	7 / 2		3	5
A.6.1	10	0	1 / 7	31	2 / 15		3	4.5
A.6.2	10	0	1 / 4	13	1 / 10		3	4.5
A.6.3	10	0	1 / 2	2	1 / 2		5	4.5
A.7.1	10	0	1 /7	26	1 / 20		3	4.5
A.7.2	10	0	1 / 4	17	2 / 10		0	4.5
A.7.2	10	0	1 / 2	3	1 / 2		0	4.5
A.8.1	10	0	1 / 7	11	2 / 5		0	4.5
A.8.2	10	0	1 / 4	8	4 / 2		3	4.5
A.8.3	10	0	1 / 2	4	0 / 10		5	4.5
A.9.1	10	0	1 / 7	53	2 / 30		4	5

The results from the SUS (System Usability Scale) scored the subjective

satisfaction with the system based on performance with these tasks to

be: 4.6 out of 5. Broadly interpreted, scores under 60 represent

systems with poor usability; scores over 80 would be considered

above average.[15]

DISCUSSION OF THE FINDINGS

[14] Note that this table is an example. You will need to adapt it to report the actual data collected.
[15] See Tullis, T. & Albert, W. (2008). Measuring the User Experience. Burlington, MA: Morgan Kaufman (p. 149).

After the usability test, there were not major issues identified. The providers and their staff felt the system was easy to use and had no difficulty locating the information that was requested.

EFFECTIVENESS

Based on the success of the usability test, Oberd is straightforward and easy to use. Even those participants with no prior use of the Oberd system where able to quickly and accurately work through the testing steps.

EFFICIENCY

Based on the time to enter, access, and review/edit the data each step took less than one minute to complete, showing the efficiency and ease of the system.

SATISFACTION

Oberd used a 5-point Likert scale to measure satisfaction of the tasks requested. There was a 4.6 out of 5 average score, showing high satisfaction rate with the use of the system.

MAJOR FINDINGS

The system was easy to use and the providers and their staff appreciated having it be a touch screen instead of having to manually enter information. This included the drop-down segments for areas with reactions. e.g allergies and their reaction.

AREAS FOR IMPROVEMENT

One area of improvement was the staff requested that there be a drop down to house patients previously reviewed/searched for.

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

6: Incentive receipt and acknowledgment form

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 _____, calling from *[Insert name of recruiting firm]*. 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 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. [If not obvious] Are you male or female? [Recruit a mix of participants]

2. Have you participated in a focus group or usability test in the past *xx* months? [If yes, Terminate]

3. Do you, or does anyone in your home, work in marketing research, usability research, web design […etc.]? [If yes, Terminate]

4. Do you, or does anyone in your home, have a commercial or research interest in an electronic health record software or consulting company? [If yes, Terminate]

5. Which of the following best describes your age? [23 to 39; 40 to 59; 60 - to 74; 75 and older] [Recruit Mix]

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 *Customize this to reflect your EHR's primary audience*

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 *Customize this to reflect what you know about your EHR's audience*

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're looking for. [If you are paying participants or offering some form of compensation, mention] For your participation, you will be paid [amount].

Would you be able to participate on [date, time]? [If so collect contact information]

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 [location]. 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

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.

Gender	
Men	[X]
Women	[X]
Total (participants)	[X]

Occupation/Role	
RN/BSN	[X]
Physician	[X]
Admin Staff	[X]
Total (participants)	[X]

Years of Experience	
Years experience	[X]
Facility Use of EHR	
All paper	[X]
Some paper, some electronic	[X]
All electronic	[X]
Total (participants)	[X]

As an appendix to the report, the full participant breakdown (de-identified) should be included.

Appendix 3: NON-DISCLOSURE AGREEMENT AND INFORMED CONSENT FORM

These are sample forms. The non-disclosure agreement is discretionary. Other examples may be found at www.usability.gov.

Non-Disclosure Agreement

THIS AGREEMENT is entered into as of _____, *2010*, between

_____ ("the Participant") and the testing organization *Test Company* located at *Address*.

The Participant acknowledges his or her voluntary participation in today's usability study may bring the Participant into possession of Confidential Information. The term "Confidential Information" means all technical and commercial information of a proprietary or confidential nature which is disclosed by *Test Company*, or otherwise acquired by the Participant, in the course of today's study.

By way of illustration, but not limitation, Confidential Information includes trade secrets, processes, formulae, data, know-how, products, designs, drawings, computer aided design files and other computer files, computer software, ideas, improvements, inventions, training methods and materials, marketing techniques, plans, strategies, budgets, financial information, or forecasts.

Any information the Participant acquires relating to this product during this study is confidential and proprietary to *Test Company* and is being disclosed solely for the purposes of the Participant's participation in today's usability study. By signing this form the Participant acknowledges that s/he will receive monetary compensation for feedback and will not disclose this confidential information obtained today to anyone else or any other organizations.

Participant's printed name: _____

Signature: _____   Date: _____

Informed Consent

Test Company would like to thank you for participating in this study. The purpose of this study is to evaluate an electronic health records system. If you decide to participate, you will be asked to perform several tasks using the prototype and give your feedback. The study will last about *60* minutes. At the conclusion of the test, you will be compensated for your time.

Agreement

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

I understand and consent to the use and release of the videotape by *Test Company*. I understand that the information and videotape is 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 *Test Company* 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 outside of *Test Company* and *Test Company'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: 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? ____Yes   ____No
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[1] → "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 colonscopy. 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 B[1] → "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 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[1]* → *"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.[16]   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

Appendix 6: INCENTIVE RECEIPT AND ACKNOWLEDGMENT FORM

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[16] Brooke, 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.

Lewis, J R & Sauro, J. (2009) "The Factor Structure Of The System Usability Scale." in *Proceedings of the*

Human Computer Interaction International Conference (HCII 2009), San Diego CA, USA

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: _____