

# **Usability Testing Report**

## **Patagonia Health EHR, Ver. 5.0, EP**

**This report format is adapted from NISTIR 7742, ver. 0.2**

**Customized Common Industry Format for Electronic Health Record**

**Usability Testing.**

# Customized Common Industry Format Template for Electronic Health Record Usability Testing

Robert M. Schumacher  
User Centric, Inc,

Svetlana Z. Lowry Information Access Division  
Information Technology Laboratory National Institute of Standards and Technology

November 2010



U.S. Department of Commerce  
*Gary Locke, Secretary*

National Institute of Standards and Technology  
*Patrick D. Gallagher, Director*

## **EHR Usability Test Report for Patagonia Health EHR Ver. 5.0, EP**

*Report adapted from ISO/IEC 25062:2006 Common Industry Format for Usability Test Reports*

Patagonia Health EHR Ver. 5.0, EP

Dates of Usability Tests: Feb 23, 2018  
Date of Report: Feb 26, 2018  
Report Prepared By: Patagonia Health Inc.  
Zeke Zecca, Test Manager, PH  
[zeke@patagoniahealth.com](mailto:zeke@patagoniahealth.com)  
919-650-2819  
15100 Weston Parkway # 204  
Cary, NC 27519

## Contents

INTRODUCTION.....	7
METHOD .....	7
PARTICIPANTS .....	7
STUDY DESIGN .....	9
TASKS .....	9
PROCEDURES .....	10
TEST LOCATION .....	11
TEST ENVIRONMENT.....	11
TEST FORMS AND TOOLS .....	11
PARTICIPANT INSTRUCTIONS.....	12
USABILITY METRICS.....	13
DATASCORING.....	14
RESULTS .....	15
DATA ANALYSIS AND REPORTING .....	15
DISCUSSION OF THE FINDINGS .....	17
EFFECTIVENESS.....	17
EFFICIENCY .....	17
SATISFACTION .....	17
MAJOR FINDINGS.....	18
AREAS FOR IMPROVEMENT .....	18
Medications .....	18
RISK ASSESSMENT .....	19
Appendix 1: RECRUITING SCREENER.....	20
Recruiting Script for Recruiting Firm.....	20
Appendix 2: PARTICIPANT DEMOGRAPHICS .....	23
Appendix 3: NON-DISCLOSURE AGREEMENT .....	24
Appendix 4: INFORMED CONSENT.....	25
Appendix 5: MODERATOR’S GUIDE .....	26
Appendix 6: Participant’s Guide. ....	32

## EXECUTIVE SUMMARY

A usability test of Patagonia Health EHR Ver. 5.0, EP was conducted on Feb 23, 2018 at Lillington, NC by Patagonia Health Incorporated. 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, ten (10) healthcare providers matching the target demographic criteria served as participants and used the EHRUT in simulated, but representative tasks.

This study collected performance data on the following tasks typically conducted using an EHR and outlined in the Meaningful Use Stage 3 requirements:

1. (a.1) CPOE –Meds
2. (a.2) CPOE – Labs
3. (a.3) CPOE – Diagnostic Imaging
4. (a.4) Drug-drug, drug-allergy interaction checks for CPOE
5. (a.5) Demographics
6. (a.6) Problem List
7. (a.7) Medication list
8. (a.8) Medication allergy list
9. (a.9) Clinical Decision support
10. (a.14) Implantable Device List
11. (b.2) Clinical Information Reconciliation and Incorporation
12. (b.3) e-Prescribing

During the 6-hour, one-on-one usability tests, each user sign an informed consent/release form (included in Appendix); they were instructed that they could withdraw at any time. Some participants had limited experience with the EHR prior to training.

Training was provided for all participants covering basic functions and navigation of the EHR. The moderator introduced the test, and instructed participants to complete a series of tasks (given one at a time) using the EHRUT. During the testing, the moderator timed the test and, along with the data logger(s) recorded user performance data on paper and electronically. The moderators did not give the participant assistance in how to complete the task.

The following types of data were collected for each participant:

1. Number of tasks successfully completed within the allotted time without assistance
2. Time to complete the tasks
3. Success/Failure
4. Number and types of errors
5. Path deviations
6. Participant's verbalizations

## 7. 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. 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.

Task	Task / Measure Tested	Task Success	Error Count	Avg. Task Satisfaction Ratings (1 – 5)
1	CPOE –Meds	93%	4	1.33
2	CPOE – Labs	100%	0	1.2
3	CPOE – Diagnostic Imaging	100%	0	1.55
4	Drug-drug, drug-allergy interaction checks for CPOE	93%	6	1.16
5	Demographics	97%	1	1.14
6	Problem List	100%	0	1
7	Medication list	100%	0	1
8	Medication allergy list	100%	0	1
9	Clinical Decision support	87%	3	1.6
10	Implantable Device List	100%	0	1.15
11	Clinical Information Reconciliation and Incorporation	97%	3	1.27
12	e-Prescribing	90%	1	1.4

Task details can be found in the Appendix.

The results from the System Usability Scale scored the subjective satisfaction with the system based on performance with these tasks to be: 85.

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

### Major findings

- Easy to learn and use interface.
- Workflow is handled smoothly even during intensive tasks.

## Areas for improvement

- Update e-prescription functionality to display buttons that are easily identifiable. Users were not clear on what buttons they were required to use
- Modify CDS feature to make it easy for users to create new rules. Provide more training for CDS alerts and how to use them.

## INTRODUCTION

The EHRUT tested for this study was Patagonia Health EHR, Ver. 5.0, EP. Designed to present medical information to healthcare providers in General & Family Practice facilities, the EHR Under Test (EHRUT) consists of the recording, storage and retrieval of patient demographics, out-patient clinical information, medication prescription and tracking, ordering of procedures and labs, patient access to medical data and numerous health reports. Providers can use the system live and interactive with patients as well as examining data privately. 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. To this end, measures of effectiveness, efficiency and user satisfaction, such as completion of tasks, accuracy of completed tasks and confidence in said tasks were captured during the usability testing.

## METHOD

### ***PARTICIPANTS***

A total of 10 participants were tested with the EHRUT. Participants in the test were Nurses, Medical Assistants & Staff. Participants were recruited by Patagonia Health Inc. In addition, participants had no direct connection to the development of or organization producing the EHRUT. Participants were not from the testing or supplier organization.

Participants were given the 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.

Recruited participants had a mix of backgrounds and demographic characteristics conforming to typical users of the EHRUT. The following is a table of participants by characteristics, including demographics, professional experience, computing experience and user needs for assistive technology.

### **PARTICIPANTS**

<i>ID</i>	Gender	Age	Education	Occupation/ Role	Professional Experience	Computer Experience	Product Experience	Assistive Technology Needs
<i>P1</i>	Female	40-49	Bachelor's Degree	Family Nurse Practitioner	168	60	42	No
<i>P2</i>	Female	30-39	Bachelor's Degree	RN	80	90	12	no
<i>P3</i>	Female	30-39	Bachelor's Degree	RN Prenatal + TB	72	84	24	No
<i>P4</i>	Female	20-29	Bachelor's Degree	Nurse - Immunizations	60	90	18	No
<i>P5</i>	Female	50-59	Master's Degree	Nurse - Communicable Disease	264	180	48	No
<i>P6</i>	Female	50-59	Master's Degree	Public Health Nursing Supervisor	312	156	48	no
<i>P7</i>	Female	40-49	Bachelor's Degree	Billing Processing Assistant	132	120	18	No
<i>P8</i>	Female	50-59	Bachelor's Degree	Business Officer	300	240	60	No
<i>P9</i>	Female	30-39	Bachelor's Degree	ERN - Child Health	192	168	54	No
<i>P10</i>	Female	40-49	Bachelor's Degree	Nurse Child Health	276	144	42	No

Participant names were replaced with Participant IDs so that an individual's data cannot be tied back to individual identities.

Ten participants (matching the demographics in the section on Participants) were recruited and ten participated in the usability test. Participants were scheduled for four 1-hour sessions with 15 - 20 minutes in between each session for debrief & review 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.

## ***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. In the test session, 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:

1. Number of tasks successfully completed within the allotted time without assistance
2. Time to complete the tasks
3. Number and types of errors
4. Path deviations
5. Participant's verbalizations (comments)
6. Participant's satisfaction ratings of the system

## ***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. CPOE –Meds
2. CPOE – Labs
3. CPOE – Diagnostic Imaging
4. Drug-drug, drug-allergy interaction checks for CPOE
5. Demographics
6. Problem List
7. Medication list

8. Medication allergy list
9. Clinical Decision support
10. Implantable Device List
11. Clinical Information Reconciliation and Incorporation
12. e-Prescribing

The 12 tasks covered measures were guided by Meaningful Use Stage 3 (2015 edition) requirements. Tasks were selected based on their frequency of use, criticality of function, and those that may be most troublesome for users. Tasks were 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). 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 another administrator / moderator.

The usability testing staff conducting the test were experienced usability practitioners with four previous studies covering software usability across several industries. The administrators / moderators moderated the session including administering instructions and tasks. The administrators / moderators also monitored task times, obtained post-task rating data, and took notes on participant comments. They also served as the data loggers and took notes on task success, path deviations, number and type of errors, and comments.

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

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

For each task, the participants were given a written copy of the task.

Task timing began once the administrator finished reading the setup and question. The task time was stopped once the participant indicated they had successfully completed the task. Scoring is discussed below in Section DATA SCORING.

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

Participants that received compensation signed a receipt and acknowledgement form (See Appendix) indicating that they had received the compensation.

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

## ***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 participants and administrators / moderators were in the test room. To ensure that the environment was comfortable for users, noise levels were kept to a minimum with the ambient temperature within a normal range. All of the safety instruction and evacuation procedures were valid, in place, and visible to the participants.

## ***TEST ENVIRONMENT***

The EHRUT would typically be used in a healthcare office or facility. In this instance, the testing was conducted in quite business and medical office facilities. For testing, the computers used were laptops running MS Windows 8 or MS Windows 10.

The participants used a mouse, pointing pad, keyboard and monitor typical of laptops and equipment used in a medical facility when interacting with the EHRUT. The EHRUT displayed directly on the laptops using fifteen-inch screens running in full color. There were no print based aspects required to complete the test.

The application was set up by the EHR vendor, Patagonia Health Inc., according to documentation describing the system set-up and preparation. The application itself was running on a remote server using a test medical practice via an internet 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. Participants Demographics

3. Non-Disclosure Agreement
4. Moderator's Guide
5. Participant's Guide
6. Post-test Questionnaire
7. Incentive Receipt and Acknowledgment Form

Examples of these documents can be found in the Appendices.

The Moderator's Guide was devised so as to be able to capture required data.

## ***PARTICIPANT INSTRUCTIONS***

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

*Thank you for participating in this study. Your input is very important. Our session today will last about six hours. 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 given time, 20 minutes, to explore the system and make comments.

Once this 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.<sup>9</sup> I will ask you your impressions about the task once you are done.*

Participants were then given seven tasks to complete. Tasks are listed in the moderator's and participants guides in the Appendix.

## ***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 *Patagonia Health EHR* by measuring participant success rates and errors
2. Efficiency of *Patagonia Health EHR* by measuring the average task time and path deviations
3. Satisfaction with *Patagonia Health EHR* by measuring ease of use ratings

## DATASCORING

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

Measures	Rationale and Scoring
<p><b>Efficiency:</b> Task Time</p>	<p>Each task was timed from when the administrator said “Begin” until the participant said, “Done.” If he or she failed to say “Done,” the time was stopped when the participant stopped performing the task.</p> <p>Only task times for tasks that were successfully completed were included in the average task time analysis. Average time per task was calculated for each task. Variance measures (standard deviation and standard error) were also calculated.</p>
<p><b>Satisfaction:</b> Task Rating</p>	<p>Participant’s subjective impression of the ease of use of the application was measured by administering both a simple post-task question as well as a post-session questionnaire. 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.</p> <p>Common convention is that average ratings for systems judged easy to use should be 3.3 or above.</p> <p>To measure participants’ confidence in and likeability of the [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 the Appendix.</p>
<p><b>Effectiveness:</b> Task Success</p>	<p>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.</p> <p>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.</p> <p>Task times were recorded for successes. Observed task times divided by the optimal time for each task is a measure of optimal efficiency.</p> <p>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</p>

	<p>Moderator's Guide must be operationally defined by taking multiple measures of optimal performance and multiplying by a factor of 2.0 that allows some time buffer because the participants are presumably not trained to expert performance. Thus, if expert, optimal performance on a task was 90 seconds then allotted task time performance was 180 seconds. This ratio should be aggregated across tasks and reported with mean and variance scores.</p>
<b>Effectiveness: Task Failures</b>	<p>If the participant abandoned the task, did not reach the correct answer or performed it incorrectly, or reached the end of the allotted time before successful completion, the task was counted as a "Failure."</p> <p>The total number of errors was calculated for each task and then divided by the total number of times that task was attempted. Not all deviations would be counted as errors. This should also be expressed as the mean number of failed tasks per participant.</p> <p>On a qualitative level, an enumeration of errors and error types are collected.</p>
<b>Efficiency: Task Deviations</b>	<p>The participant's path (i.e., steps) through the application was recorded. Deviations occur if the participant, for example, went to a wrong screen, clicked on an incorrect menu item, followed an incorrect link, or interacted incorrectly with an on-screen control.</p>

## **RESULTS**

### **DATA ANALYSIS AND REPORTING**

The results of the usability test were calculated according to the methods specified in the Usability Metrics section above. Participants who failed to follow session and task instructions had their data excluded from the analyses. There were no exclusions in this test based on that criteria.

The usability testing results for the EHRUT are detailed below. The results should be seen in light of the objectives and goals outlined in Section: Study Design. The data should yield actionable results that, if corrected, yield material, positive impact on user performance.

Task #	Task / Measure Tested	Task Success	Max. Deviation Observed Count	Avg. Task Time (sec)	Task Time Optimal (sec)	Errors Count	Task Satisfaction Ratings
1	CPOE –Meds	93%	3	138	< 150	4	1.33
2	CPOE – Labs	100%	3	65	< 90	0	1.2
3	CPOE – Diagnostic Imaging	100%	3	98	< 100	0	1.55
4	Drug-drug, drug-allergy interaction checks for CPOE	93%	3	71	< 90	6	1.16
5	Demographics	97%	2	132	< 150	1	1.14
6	Problem List	100%	2	50	< 30	0	1
7	Medication list	100%	1	32	< 30	0	1
8	Medication allergy list	100%	4	105	< 120	0	1
9	Clinical Decision support	87%	4	68	< 60	3	1.6
10	Implantable Device List	100%	2	142	< 180	0	1.15
11	Clinical Information Reconciliation and Incorporation	97%	4	68	< 60	3	1.27
12	e-Prescribing	90%	2	134	<120	1	1.4

Aggregated results per full measure.

The results from the Likert scale scored the subjective satisfaction with the system based on performance with these tasks to be: 1.228. The satisfaction survey yields a single number that represents a composite measure of the overall perceived usability of the system.

Satisfaction scores have a range of 1 to 5, 1 being most satisfied and 5 being least satisfied. and the score is a relative benchmark that is used against other iterations of the system. Broadly interpreted, % satisfaction scores under 60 represent systems with poor usability; scores over 80 would be considered above average.



Participant ID	Average Satisfaction Score (1 being best)	% Satisfaction
1	1.024	99.5%
2	1.073	98.5%
3	1.195	96.1%
4	1.415	91.7%
5	1.073	98.5%
6	1.195	96.1%
7	1.563	95.6%
8	1.220	95.6%
9	1.317	93.7%
10	1.275	95.1%

## ***DISCUSSION OF THE FINDINGS***

### **EFFECTIVENESS**

Most of the 41 sub-tasks were performed with a 100% success rate. Reasons for failure were inexperience in clinical terminology, insufficient training and confusing interface. Additional training is expected to resolve most of these errors.

### **EFFICIENCY**

Optimal times can vary wildly depending on the user's environment, workload and clinical situation at hand. For this test, the task times chosen were considered as optimal in a quiet, unhurried, unpressured environment.

On average, 4 tests had below the optimally defined time. The high / low variance for those 4 tasks was also within the optimal time.

### ***SATISFACTION***

Participant satisfaction rated very high. Task satisfaction ratings averaged 1.8. Participant experience with the EHRUT (outside of test day training) prior to the test ranged from "Some Experience" to "None". They were all asked to evaluate their experience only on the tasks and subtasks performed during the test.

## **MAJOR FINDINGS**

Overall the participants were aptly able to maneuver through the EHRUT and adequately and easily perform the 41 subtasks within the 12 major tasks.

Many similar paths were covered in overlapping tasks such as CPOE, medications and allergies. In areas where participants may have stumbled on their first try, they quickly learned the optimal path and performed a similar task without issue. This was observed over and over while repetitively watching a total of 41 subtasks – even with first time EHR users.

In general, the EHRUT uses common UI conventions meeting user’s expectations for product navigation and data entry and retrieval. In areas that are unique to the workflow in the EHRUT, color schemes and other visual cues lend themselves to quick learning.

Of the areas tested, Clinical Decision Support and CPOE medications were arguably the most complicated - both in terms of the clinical outcome desired and in the use of multiple windows and logins to accomplish the task. Utilizing a well-designed interface, these measures had high success rates and low path deviations.

There were two areas where participants were unable to complete the task or completed it with difficulty.

## **AREAS FOR IMPROVEMENT**

Based on the findings above, there are some obvious changes that will improve the user experience, facilitate faster product education and reduce the possibilities of errors entered into a patient’s Orders & Procedures and Medications.

### **Medications**

Changing the dosage of an existing prescription requires deleting the prescription and re- prescribing the drug using the altered dose. There is already an “Edit” button to change every other aspect of the prescription. Possibly this could be extended to cover dose changes as well. Discontinuing an existing prescription is easy once you know where the “D/C” button is located.

A simple solution is to change the button name to “Discontinue” and add the “Discontinue” header to the top of the associated column in the “Current Medications” table.

Medications and Allergies are displayed in a similar fashion on the same page but each uses a different UI to delete an item.

A smoother workflow would be to make them look similar even if functionally they perform different actions.

Electronically Transmitting an Rx to a pharmacy requires finding the “Transmit Rx” button. It’s in a slightly different location than other action buttons on the page.

Grouping all the action buttons together may help. The prescription page uses a tab like structure across the page.

During Rx transmission, the user is automatically switched to a different tab. The layout and color scheme of each tab page is very similar. None of the participants realized this switch during their first few transmissions making it difficult to move on to the next subtask. Using different colors may help to inform and distinguish to the user that the tab view has changed.

## ***RISK ASSESSMENT***

Assessing the risk to the patient is based on the following:

1. Incorrect clinical data was added to the patient’s record.
2. The patient’s record is missing expected clinical data.
3. Incorrect medication, procedures or orders were added.
4. The patient’s record is missing expected medications, procedures or orders.
5. Incorrect medical assessments are made based on the incorrect or missing data.

Of the two major areas of improvement identified above, (CDS and CPOE Medications), CPOE has the potential to be the most problematic. Finding the correct test with the specific set of predefined instructions can be frustrating. This could lead to the provider not making any entry (2) or entering the correct test with incomplete or incorrect instructions (1). However, this testing, and field observations, reveal no known instances of incorrect tests or test instructions ordered. Providers have the ability to select the correct test and manually override the predefined test instructions. Missing test entries in this study happened to participants new to the EHRUT. While experienced participants encountered similar difficulties, there were able to persist and complete the task. Estimated risk of failure is LOW.

Prescribing medications demonstrated one failure to complete (4) the task in this study. The participant, new to the EHRUT, could not find the e-prescription transmit button labeled “Tx”. All other participants, and field observations, succeeded without error after complete training and a round or two of hands-on experience. In no case during the study or from known field reports have participants or users entered an incorrect prescription (3) and not been able to detect and correct it. Estimated risk of failure is VERY LOW.

Of the measures tested in this study the estimated risk of a provider making incorrect medical assessments (5) is LOW.

## **Appendix 1: 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](http://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

We would like to ask you a few questions to gather demographic information about prospective users of the EHR. This should only take a few minutes of your time. This is strictly for research purposes.

Name of participant:

Address:

City, State, Zip:

Daytime phone number:

Email address:

Gender:

Age Group:

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, have a commercial or research interest in an electronic health record software or consulting company?
3. Do you require any assistive technologies to use a computer? [if so, please describe]
4. What is your current position and title? (Must be healthcare provider)  
RN: Specialty \_\_\_\_\_  
Physician: Specialty \_\_\_\_\_  
Resident: Specialty \_\_\_\_\_  
Administrative Staff
5. How long have you held this position?
6. Describe your work location (or affiliation) and environment? [e.g., private practice, health system, government clinic, etc.]
7. In the last month, how often have you used an electronic health record?
8. How many years have you used an electronic health record?
9. How many EHRs do you use or are you familiar with?

**Appendix 3: NON-DISCLOSURE AGREEMENT**

THIS AGREEMENT is entered into as of \_\_\_\_\_, 2013, between \_\_\_\_\_ ("the Participant") and the testing organization *Patagonia Health* located at 15100 #204 Weston Parkway, Cary, NC 27519

The Participant acknowledges that his or her voluntary participation in today's usability study may bring the Participant into possession of Confidential Information. The term "Confidential Information" means all technical and commercial information of a proprietary or confidential nature which is disclosed by *Patagonia Health*, 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 *Patagonia Health* 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: \_\_\_\_\_



**Appendix 4: INFORMED CONSENT**

*Patagonia Health* 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 4 hours. 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 *Patagonia Health* 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 *Patagonia Health*.

I understand and consent to the use and release of electronic recording by *Patagonia Health*. I understand that the information and recording 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 recording and understand the recording may be copied and used by *Patagonia Health* 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 outside of *Patagonia Health*. 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.

**Name:** \_\_\_\_\_

**Signature:** \_\_\_\_\_

**Date:** \_\_\_\_\_

***Appendix 5: MODERATOR'S GUIDE***

# Meaningful Use 3 Safety Enhanced Design Study Feb 23 2018

## Moderator's Guide

*Patagonia Health*

*Patagonia EHR, version 5.0*

Moderator 1: \_\_\_\_\_

Moderator 2: \_\_\_\_\_

Location: \_\_\_\_\_

Participant #: \_\_\_\_\_

Test Date: \_\_\_\_\_

Start Time: \_\_\_\_\_

End Time: \_\_\_\_\_

Prior to the Testing Session

## **Ensure that the Recording Equipment and Software is Running Properly**

### **Sign into Patagonia EHR**

**Turn on the testing computer**

**Open the Firefox web browser**

**Go to:** *https://www.patagoniaemr.com*

*NOTE: Patient names used in testing will end with the participant number.*

### **Upon Participant Arrival**

#### **Obtain Consent and NDA From the Participant**

##### **Read the following to the participant:**

“Thank you for coming today. My name is \_\_\_\_\_, and I’ll be working with you today.”

“In this study, we’re evaluating the usability of electronic health record systems. To do this, we will have you fill out some surveys and complete seven tasks. Each task will include a number of steps. We will be watching and recording how you perform these tasks. This will include us taking notes as well as recording screenshots and audio of your feedback. All recordings and information that you provide will be kept confidential and you will in no way be identified in any of our reports.”

“Each task will include a scenario to explain why you are doing the task. As you work, feel free to perform whatever steps you feel are necessary to complete the tasks. I can try to answer questions about information that you might feel is missing, but I cannot provide you with directions on how to complete the task.”

“You are free to stop or take a break at any time, and that will not affect any consideration we will be providing. Please let me know if you need anything to make yourself more comfortable.”

“Before we begin, I will need you to read over these documents and sign them. The first describes the study and your rights as participant and the other is a non-disclosure agreement. When you have read and signed them, you may give them to me.”

“Do you have any questions for me?”

##### **Provide Consent Form and Obtain Signed Copy**

Completed? \_\_\_\_\_

##### **Provide Non-Disclosure Agreement and Obtain Signed Copy**

Completed? \_\_\_\_\_

***During the Testing Session*****Administer Demographic Survey****Provide Demographic Survey to the participant**

Completed? \_\_\_\_\_

**Read the following to the participant:**

“This is a survey to tell us a little more about you and your background. When you have finished, we will do some basic training with the EHR system and I will then provide you with the task scenarios and begin the study.”

**Provide Training*****Get the system working/prepared to provide training*****Take control of the computer and go to the Home Screen****Read the following to the participant:**

“This is the Patagonia EHR system. You will be using this system to complete the study. Before we begin, we will demonstrate a few things in the EHR that will be necessary for you to complete the tasks.”

“First, this is the Dashboard. You select patients here. You open records like this...”

“Second, some patient encounters will include the creation of an Encounter Note. There are various Encounter Note Formats. Today we will be using EN format “<format name>”. The Encounter Note is also the place where Lab Orders, Procedures, and Images are ordered.”

“Third, medications are created by using the Medications App/Window ”

**Provide Task Instructions****Ensure that the EHR is on the “starting screen”**

Completed? \_\_\_\_\_

**Provide the Task 1 Instructions to the participant**

Completed? \_\_\_\_\_

**Read the following to the participant:**

“Here are the instructions for the first task. Each set of instructions provides you with a brief scenario explaining the task that you are to accomplish using the Patagonia EHR system. In some cases, you will be required to input data into the system to complete the task. You may refer to these instructions at any time. I will provide the next set of instructions when you finish this task.”

“In this study we are interested in whether you can complete the tasks, not about your medical decision-making skills or ability to catch a mistake in the record, so please do not spend time reviewing the patients’ histories in detail. Assume that everything in the record is accurate unless otherwise specified in the task instructions. Work as quickly as possible, but focus on completing the task rather than worry about how long it might be taking.”

“Do you have any questions?”

### **Moderator Tasks**

**Begin any timers and recording devices used in this test.**

**Allow the participant to start the task.**

**Stop the timer when the participant indicates they have completed the task.**

**Allow the participant complete the task.**

**Use the data collection forms to make notes and measure performance.**

**Repeat this process until all tasks have been completed.**

### ***Upon Test Completion***

**Provide the SUS to the participant and read the following:**

“Great, now we have two surveys left. Please fill this one out to the best of your ability. When you are done, I will give you the next one.”

**Provide the Post-Test Survey and read the following:**

“This is the last survey. Again, please complete it to the best of your ability.”

**End Session Recording**

**Debrief Participant**

**Read the following:**

“Great! That completes our study. I want to thank you for taking the time to complete this study. As you know, the purpose of this study is to allow us to assess the usability of an EHR system and your input has been very valuable.”

“Do you have any questions before you go?”

“Thanks again!”

***Upon Participant Departure***

**Back-up Participant Data**

**Reset Patient Scenarios**

Open each patient chart and either add or remove data that was removed or added as part of the task so that the next participant will start with a clean slate.

**Sample Score Recording**
**Task 1&7a – View compose Rx Page – 170.315.a.1-1, 1.7-1, b.3-1 (Kevin Duster)**

\* Start timers, recording & instruct participant to begin task.

**Effectiveness**

<input type="checkbox"/> Easily Completed (without help < 1 min)  <input type="checkbox"/> Completed with difficulty or help (help < 3 min)  <input type="checkbox"/> Not Completed (7 min or more)	Notes:
---	--------

**Efficiency**

*Optimal Path: View patient page, View Meds widget, Click ERX button.*

Task Time: _____ (mm:ss)  Number of Deviations  _____	Notes:
--	--------

**Satisfaction**

On a scale of 1 to 5  Easy - - - - - Difficult 1 2 3 4 5  How would you rate this task?  Rating: [     ]	Notes:
--	--------

***Appendix 6: Participant's Guide.***

# Meaningful Use 3 Safety Enhanced Design Study Feb 23 2018

## Participant's Guide

*Patagonia Health*  
*Patagonia EHR, v. 5.0*

***Participant #***



**PARTICIPANT DEMOGRAPHICS**

***Below are a few questions to gather demographic information about prospective users of the EHR. This should only take a few minutes of your time.***

***Name of participant:***

***Address:***

***City, State, Zip:***

***Daytime phone number:***

***Email address:***

***Gender:***

***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, have a commercial or research interest in an electronic health record software or consulting company?***

***3. Do you require any assistive technologies to use a computer? [if so, please describe]***

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

**RN: Specialty** \_\_\_\_\_

**Physician: Specialty** \_\_\_\_\_

**Resident: Specialty** \_\_\_\_\_

**Administrative Staff**

**5. How long have you held this position?**

**6. Describe your work location (or affiliation) and environment? [e.g., private practice, health system, government clinic, etc.]**

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

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

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

## Non-Disclosure Agreement

THIS AGREEMENT is entered into as of February 23, 2018, between \_\_\_\_\_ ("the Participant") and the testing organization Patagonia Health located at 15100 # 204 Weston Parkway, Cary, NC 27560.

The Participant acknowledges that his or her voluntary participation in today's usability study may bring the Participant into possession of Confidential Information. The term "Confidential Information" means all technical and commercial information of a proprietary or confidential nature which is disclosed by Patagonia Health, 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 Patagonia Health 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:** \_\_\_\_\_

**Task 1&7 Instructions – Record, Change & Display Medications****(Patient: Kevin Duster##, Male, DOB: 1/23/1972)****In this section, you will Record, Change & Display Medications.****Scenario**

Patient *Kevin Duster##* is a 41 year old professor. He has not been treated for some time and has recently returned for medical care. He has a history of heart disease, hypertension and depression. He suffered a heart attack in 2009.

Patient is complaining of occasional chest discomfort and lightheadedness.  
Today's plan is to get Mr. Duster back on his medication treatment regiment.

**Set-Up**

1. Login to the EHR using the provided credentials: mu3provider## / mu3provider##
2. Enter & select, *Kevin Duster##*, in the patient search to view the patient's chart.
3. Bring the Medications section into view. It should look similar to this:

**Stop and inform the Moderator when you have reached this point.**

Similar instructions were provided for remaining tasks