User Centered Design Process and
EHR Usability Test Report of eMedRec Version 8.1


eMedRec by Holt Systems  Version 8.1

Date of Usability Test: August 1, 2015
Date of Report: September 10, 2015

Cover Letter

This cover letter provides a brief overview of the Participatory Design\(^1\) processes utilized in the initial development of eMedRec and its subsequent releases. Also addressed are the ongoing usability study processes and risk assessment methods used by Holt Systems in the development process.

eMedRec was initially conceived and designed in 2001. Principal developers from Holt Systems conducted series of conferences with a group of 8 specialist physicians to address the patient charting and office workflow issues as experienced in a multi-location specialty medical practice environment. It was decided that the objectives of Participatory Design would be best achieved by holding frequent development and design meetings and by moving the chief software developer’s office into the medical office environment to work directly with physicians and end users on a daily basis. The framework for ongoing design and usability decision making decided upon at that time has continued throughout the years. Holt Systems’ development and support staff continues to work as partners with the end users.

At all stages of conception, design, programming, and testing the physicians and end users are actively involved in all processes. User feedback is continually and actively solicited and is the basis for the user interfaces and software enhancements. Usability testing is an ongoing process more actively in the development and beta testing stages, and more recently has been expanded to include regular testing of the mature product as well as new features. Product end users are solicited to volunteer for testing and the medical practice staff have enthusiastically participated.

While the usability testing and development has been an internal function for Holt Systems we have relied upon the research and experience of industry experts when considering risk assessment and design processes. The first and most essential basis of consideration in risk assessment in the design process at Holt Systems is our internal support database where end user support calls have been logged for over a decade. We also track industry trade journals and sources including the valuable work from the Human Factors and Ergonomics Society which produced the attached graphic on the subject of EHR risk factors.\(^2\)

The usability testing report which follows includes results obtained from end user testing conducted by the senior training manager of Holt Systems, Karen Mann. Laura Holt accumulated the results into the attached report. Please address any questions you may have concerning this most recent testing and I will be delighted to provide further information on either the process or the results.

All the best,

Laura M Holt, VP
Holt Systems, Inc.

\(^1\) More on Participatory Design principals - [http://www.usabilitybok.org/participatory-design](http://www.usabilitybok.org/participatory-design)

### Prioritized Certification Criteria

- **Drug-drug, Drug-Allergy**
- **Prescribing**
- **Electronic Medication Administration Record (eMAR)**
- **Medication List**
- **Clinical Decision Support (CDS)** - Clinical Checks - Clinical Drug/Drug Interaction Checks - Clinical Medication List and Medication Unit

### Objective

- Enhance Drug-drug, Drug-Allergy
- Prevent Prescribing
- Electronic Medication Administration Record (eMAR)
- Medication List
- Clinical Decision Support (CDS)

### Discussion

- **Strengths**
  - Related to patients, providers, and users: ease of use by patients, providers, and users
  - Related to providers, such as benefits to providers
  - Related to users, such as benefits to users
- **Recommendations**
  - Provide user-centered design and evaluation feedback to vendors
  - Provide user-centered design and evaluation feedback to vendors and providers
  - Provide user-centered design and evaluation feedback to vendors, providers, and users

### Results

- **Percent Task Success Averaged Over Products**
  - **Average Risk Score**
  - **Percent Task Fails x Critical Error Risk Score**
  - **Critical Error Risk Score**

### Introduction

The Office of the National Coordinator (ONC) through its Meaningful Use Stage 2 (MUS2) certification programs calls for a focus on improved usability to enhance patient safety and user management. Enhanced Design Test Procedures, “2014). Known as Safety Enhanced Design, formative and summative user centered design (UCD) activities must take place during the design and development of the eight prioritized certification criteria and associated capabilities designated by ONC. Enhanced Design Test Procedures, “2014). Known as Safety Enhanced Design, formative and summative user centered design (UCD) activities must take place during the design and development of the eight prioritized certification criteria and associated capabilities designated by ONC.

### Methods

- **338 Participants**
- **9 EHRs**

### Observed Usage Errors During Meaningful Use Stage 2 Safety-Enhanced Design Summative Testing

- **Percent Task Fails x Critical Error Risk Score**
- **Critical Error Risk Score**
- **Observed Usage Errors During Meaningful Use Stage 2**
- **Safety-Enhanced Design Summative Testing**
- **Introduction**
- **Percent Task Success Averaged Over Products**
  - **Average Risk Score**
  - **Percent Task Fails x Critical Error Risk Score**
  - **Critical Error Risk Score**

### Lessons Learned

- **Enhanced information is needed across all stakeholders.**
- **A better application of a User-Centered Design process can be made to ensure improvements in the areas of error prevention and user experience.**

### How can these reports be used in a production way?

- How can the data in these reports be used to make EHRs safer and more effective in support of providing quality care?
- How can the data in these reports be used to make EHRs safer and more effective in support of providing quality care?


eMedRec by Holt Systems Version 8.1

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EXECUTIVE SUMMARY

A usability test of eMedRec V8.1 was conducted August-September 2015 in Palm Beach County Florida by Holt Systems Inc. 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, eight (8) 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 7 tasks typically conducted on an EHR:

- Computerized Provider Order Entry 170.314(a)(1)
- Drug/Drug, Drug/Allergy interaction Check 170.314(a)(2)
- Maintain Medication List 170.314(a)(6)
- Maintain Allergy List 170.314(a)(7)
- Clinical Decision Support 170.314(a)(8)
- Electronic Prescribing 170.314(b)(3)
- Clinical information Reconciliation 170.314(b)(4)

During the 30 minute one-on-one usability test, each participant was greeted by the administrator and given a brief overview of the tasks to be performed; they were instructed that they could withdraw at any time. Participants had prior experience with the EHR. The administrator introduced the test, and instructed participants to complete a series of tasks using the EHRUT. During the testing, the administrator timed the test and recorded user performance data on paper and electronically. The administrator did not give the participant assistance in how to complete the task. Participant screens and comments 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. Participants were volunteers from the active user population. Various recommended metrics, in accordance with the examples set forth in the NIST Guide to the Processes Approach for Improving the Usability of Electronic Health Records, were used to evaluate the usability of the EHRUT. Following is a summary of the performance and rating data collected on the EHRUT.

<table>
<thead>
<tr>
<th>Measure / Task</th>
<th>N</th>
<th>Task Success¹</th>
<th>Path Deviation</th>
<th>Task Time</th>
<th>Errors</th>
<th>Task Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Deviations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Observed/Optimal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Computerized Provider Order Entry</td>
<td>16</td>
<td>100%</td>
<td>See Notes</td>
<td>27.6 sec</td>
<td>0</td>
<td>1.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>29.3</td>
<td></td>
<td>.60</td>
</tr>
<tr>
<td>2. Drug/Drug, Drug/Allergy interaction</td>
<td>8</td>
<td>100%</td>
<td>5.6 sec</td>
<td>3.0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Check</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>3. Maintain Medication List</td>
<td>8</td>
<td>100%</td>
<td>5.4 sec</td>
<td>3.9</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>4. Maintain Allergy List</td>
<td>8</td>
<td>100%</td>
<td>5.6 sec</td>
<td>3.0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>5. Clinical Decision Support</td>
<td>16</td>
<td>100%</td>
<td>6.7 sec</td>
<td>8.3</td>
<td>0</td>
<td>1.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.25</td>
</tr>
<tr>
<td>6. Electronic Prescribing</td>
<td>8</td>
<td>100%</td>
<td>40.5 sec</td>
<td>19.8</td>
<td>0</td>
<td>1.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.46</td>
</tr>
<tr>
<td>7. Clinical information Reconciliation</td>
<td>8</td>
<td>100%</td>
<td>23.4 sec</td>
<td>15.2</td>
<td>0</td>
<td>1.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.46</td>
</tr>
</tbody>
</table>

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

Major findings

One area that was intended to be tested was dropped after the first few tests because they were not providing relevant information. The Optimal Path as selected by development was only one of several paths which obtained the same results in the same amount of time. There was no one best path.

We also found that the times estimated for task completion by development and support staff were significantly longer than the times experienced users were able to actually complete the same tasks.

Areas for improvement

The widest deviation was noted between new users of the software and the experienced users. The ideal path for Order Entry was determined to be less intuitive than other functions of the software. This GUI will be examined for possible improvement in either design or training.

INTRODUCTION

The EHRUT tested for this study was eMedRec Version 8.1 Designed to present medical information to healthcare providers in small to medium group ambulatory practices the EHRUT consists of a hybrid solution of data entry and document management. 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 ease of use and completion of task in a timely manner were captured during the usability testing.

METHOD

PARTICIPANTS

A total of 8 participants were tested on the EHRUT. Participants in the test were healthcare providers. Participants were recruited by Holt Systems Inc. and were volunteers. 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 actual end users of the EHRUT. The EHRUT was initially conceptualized and designed by healthcare providers. All changes and upgrades to the EHRUT have been designed in response to and in coordination with active healthcare providers. The participants in the Usability Testing were not part of the design teams but healthcare users of the EHRUT with varying levels of experience and training on the EHRUT.

For the test purposes, end-user characteristics were identified and translated into 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 and professional experience. Participant names were replaced with Participant IDs so that an individual’s data cannot be tied back to individual identities. Eight (8) participants (matching the demographics in the section on Participants) were recruited and Eight (8) participated in the usability test. No participants failed to show for the study.

<table>
<thead>
<tr>
<th>PartID</th>
<th>Gender</th>
<th>Age</th>
<th>Education</th>
<th>Role</th>
<th>Professional Experience</th>
<th>Product Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SE1</td>
<td>F</td>
<td>40s</td>
<td>MA</td>
<td>OM</td>
<td>15 yr</td>
</tr>
<tr>
<td>2</td>
<td>LE1</td>
<td>F</td>
<td>40s</td>
<td>MA</td>
<td>MA</td>
<td>7 yr</td>
</tr>
<tr>
<td>3</td>
<td>SFD</td>
<td>F</td>
<td>30s</td>
<td>AS</td>
<td>OM</td>
<td>10 yr</td>
</tr>
<tr>
<td>4</td>
<td>AW1</td>
<td>F</td>
<td>50s</td>
<td>BA</td>
<td>OM</td>
<td>32 yr</td>
</tr>
<tr>
<td>5</td>
<td>MO2</td>
<td>F</td>
<td>20s</td>
<td>BA</td>
<td>MA</td>
<td>1 yr</td>
</tr>
<tr>
<td>6</td>
<td>SFB</td>
<td>F</td>
<td>30s</td>
<td>BA</td>
<td>MA</td>
<td>5 yr</td>
</tr>
<tr>
<td>7</td>
<td>MO3</td>
<td>F</td>
<td>20s</td>
<td>HS</td>
<td>MA</td>
<td>5 yr</td>
</tr>
<tr>
<td>8</td>
<td>MO1</td>
<td>F</td>
<td>20s</td>
<td>HS</td>
<td>MA</td>
<td>1 yr</td>
</tr>
</tbody>
</table>

Age ranges 20-29 = 20s; 30-39 = 30s; 40-49 = 40s; 50-59 = 50s
HS=High School   AS=Associates degree   BA=Bachelors degree   MA=Masters degree
OM= Office Manager   MA=Medical Assistant
No physicians were included in this particular test because they do not perform all the tasks tested.
Participants were scheduled for 30 minute sessions with one participant scheduled per day to allow for debrief by the administrator and data logger, 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.

**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 will serve as a baseline for future tests with an updated version of the same EHR. In short, this testing serves as both a means to record or benchmark current usability, but also to identify areas where improvements must be made.

During the usability test, participants interacted with one EHR. Each participant used the system in their usual office 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

**TASKS**

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

1. Computerized order entry. Two unrelated orders tested.
2. Check for Drug/Drug Drug/Allergy for one medication order.
4. Update Allergies
6. ePrescribe
7. Clinical Information Reconciliation – Receive, compare, and incorporate C-DCA data.

Tasks were selected based on their frequency of use, criticality of function, and those required for product certification. Previous studies have covered routine and frequent tasks in the base product over the years. The actual order of the execution of the tasks will vary from this list and more closely resemble actual clinical use of the EHRUT.

**PROCEDURES**

Upon remote connection, participants were greeted; their identity was verified and matched with a name on the participant schedule.

The usability testing administrator conducting the test was an experienced usability practitioner with eight (8) years of experience with the EHRUT. 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. They also served as the data logger and took notes on task success, path deviations, number and type of errors, and comments.

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

• As quickly as possible making as few errors and deviations as possible.

• Without assistance; administrators were allowed to give immaterial guidance and clarification on tasks, but not instructions on use.

• Without using a think aloud technique.

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

Following the session, the administrator gave the participant the post-test questionnaire (see Appendix), 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.

TEST LOCATION AND ENVIRONMENT

The test participants used their own computer terminals at their place of employment to ensure maximum comfort in their usual work environment. The environment was verified as comfortable for users, noise levels were kept to a minimum with the ambient temperature within a normal range. The test administrator accessed and observed the completion of tasks via remote access to the participants terminal. The tests were conducted in August and September 2015.

The EHRUT would typically be used in a healthcare office or facility. In this instance, the testing was conducted in a variety of healthcare facilities with permission from the managing physicians. For testing, the participants used a variety of computer types and operating systems and the user connected to the EHRUT via remote desktop protocol to a Cloud environment hosting the EHRUT. The participants used their keyboard and mouse when interacting with the EHRUT. The application itself was running on a Cloud platform using the actual healthcare practice database and several test patients that were established specifically for the testing function on a WAN connection.

Technically, the system performance 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. Examples of these documents can be found in Appendices. 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 administrator’s machine.

PARTICIPANT INSTRUCTIONS

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

Thank you for participating in this study. Your input is very important. Our session today will last about 30 minutes. During that time you will use an instance of an electronic health record. I will ask you to complete a few tasks using this system and answer some questions. You should complete the tasks as quickly as possible making as few errors as possible. Please try to complete the tasks on your own following the instructions very closely. Please note that we are not testing you we are testing the system, therefore if you have difficulty all this means is that something needs to be improved in the system. I will be here in case
you need specific help, but I am not able to instruct you or provide help in how to use the application.

Overall, we are interested in how easy (or how difficult) this system is to use, what in it would be useful to you, and how we could improve it. I did not have any involvement in its creation, so please be honest with your opinions. All of the information that you provide will be kept confidential and your name will not be associated with your comments at any time. Should you feel it necessary you are able to withdraw at any time during the testing.

Following the procedural instructions, participants were asked to open their written instructions to explore the requirements and make comments. Once this task was complete, the administrator gave the following instructions:

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

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 [EHRUT] by measuring participant success rates and errors
2. Efficiency of [EHRUT] by measuring the average task time and path deviations
3. Satisfaction with [EHRUT] by measuring ease of use ratings

DATA SCORING

Rationale and Scoring
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. There were no failures or errors.

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 \(x \times 1.25\) seconds. This ratio should be aggregated across tasks and reported with mean and variance scores.

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

The total number of errors was calculated for each task and then divided by the total number of times that task was attempted. Not all deviations would be counted as errors. This should also be expressed as the mean number of failed tasks per participant.

On a qualitative level, an enumeration of errors and error types should be collected.

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.

RESULTS

It is strongly recommended that task deviations be reported. Optimal paths (i.e., procedural steps) should be recorded when constructing tasks.

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.

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 5 (Very Difficult) to 1 (Very Easy). These data are averaged across participants.

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

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.”

MAJOR FINDINGS

In the specific areas tested in this Usability Study the success rate (100%) and the times observed were less than the expectations of the development team. User responses to narrative questions follows:

What was your overall impression of this system?
Impressive Fairly easy and practical
The system has been working to fit all our needs. We wouldn’t change systems.
Like it a lot Very exciting and user friendly
Fast and easy Big fan of eRx, loving the ordering system

What aspects of the system did you like most?
Ease of understanding Orders and Scripts
Ease of ePrescribing Loved it all to tell you the truth
Makes things easier and faster. Creates less paper. eRx
Orders User friendliness

What aspects of the system did you like least?
All functions not being utilized: mail, scheduling, appt. Need to have test level tracking (lithium)
Lack of access when internet is down
Nothing really. Quite satisfied with the system. New features sometimes takes a bit to find new buttons.
Nothing (x3) Occasional Freezing

Were there any features that you were surprised to see?
Scheduling and appointments, facesheet – did not know features existed.
No (x3) Orders (x2)
Orders and importing continuity of care Click buttons for orders

What features did you expect to encounter but did not see? That is, is there anything that is missing in this application?
Secure messaging from patient to office.
A refresh button for chart viewing. (x3)
Nothing (x4)

Compare this system to other systems you have used.
Much better than Lytec. Have not used other systems. (x6)

Would you recommend this system to your colleagues?
Yes (x8)

AREAS FOR IMPROVEMENT

There were two areas of improvement identified through the testing process.

Order Entry: The flow of the Order Entry module could be improved graphically to be more intuitive. The users performed the tasks without error, but the administrator noted a clumsiness of workflow. This will be explored in more detail with the development team.

Training to expose users to additional features: The administrator noted that several users were unaware of various functions of the product because they did not use these in their daily tasks. A method of exposing existing users to unused modules is being explored by the training team.

The administrator also noted that the participants were enthusiastic and often wanted to go over the scheduled time to discuss the EHRUT and their experiences. In future tests more time for unstructured comments from users should be scheduled.
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

We are recruiting individuals to participate in a usability study for eMedRec. We would like to ask you a few questions to see if you qualify and if you would like to participate. This should only take a few minutes of your time. This is strictly for research purposes. Would you answer a few questions?

1. Have you participated in a focus group or usability test in the past 6 months?
2. Do you, or does anyone in your home, work in marketing research or usability research?
3. Do you, or does anyone in your home, have a commercial or research interest in an electronic health record software or consulting company?
4. Which of the following best describes your age? [20s; 30s; 40s; 50s]
5. Professional Demographics: What is your current position and title?
6. How long have you held this position?
7. 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)]
8. How many years have you used electronic health record software?
9. How many EHRs do you use or are you familiar with?

We will coordinate with your office manager to arrange a time for the online study.

May I get your contact information?

☐ Name of participant:
☐ Practice:
☐ Daytime phone number:
☐ Email address:

This study will take place at via remote connection with your workplace workstation. I will confirm your appointment before your session. What time is the best time to reach you?
Appendix 2: PARTICIPANT DEMOGRAPHICS

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

<table>
<thead>
<tr>
<th>Gender</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Men</td>
<td>[0]</td>
</tr>
<tr>
<td>Women</td>
<td>[8]</td>
</tr>
<tr>
<td>Total (participants)</td>
<td>[8]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Occupation/Role</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>RN/BSN</td>
<td>[5]</td>
</tr>
<tr>
<td>Physician</td>
<td>[0]</td>
</tr>
<tr>
<td>Admin Staff</td>
<td>[3]</td>
</tr>
<tr>
<td>Total (participants)</td>
<td>[8]</td>
</tr>
</tbody>
</table>
Appendix 3: MODERATOR’S GUIDE

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:
☐ Thank participant for their time
After all testing
☐ Back up data files

Orientation (1 minute)
Thank you for participating in this study. Our session today will last 20 minutes. During that time you will take a look at eMedRec. 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 or 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 the current version of eMedRec that you use on a daily basis. Some of the data may not make sense as it is placeholder data. We are recording 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 (1 minute)
What is your job title?

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 (60 Seconds)

This is eMedRec, the application you will be working with. Are you very familiar with the software?

☐ Show test participant the EHRUT.
Please don’t click on anything just yet. What do you notice? What are you able to do on this screen? Please make any general comments on the opening screen of eMedRec.

Participant Notes / Comments:

Task 2 Patientthree: Retrieve patient chart – The patient’s name is Test Patientthree MRN: Testpa3 (10 Seconds)

Success:
• Easily completed
• Completed with difficulty or help :: Describe below
• Not completed
Participant Comments:

Task Time: ________ Seconds

Optimal Path: Click on Search Bar, enter MRNumber or partial name to search
• 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: Import CCD file (45 Seconds)

A CCD file has been received for the patient from another physician. Import the medication list, problem list, and allergies content of that file.

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

Comments:

Task Time: ________ Seconds

Optimal Path: Click Tools – Continuity of Care – Import – CCD – Import CCD – Select file from My Documents - CCD-Pat3 – Click Medication Tab – Select desired medication to import – Click Problems – Select desired items to import – Click Allergies – Select items to import - Save Patient Record
• Correct
• Minor Deviations / Cycles :: Describe below • Major Deviations :: Describe below

Comments:
Observed Errors and Verbalizations:
Comments:
Task 4 Patientthree: Review imported Meds, Allergies, and Problems after clearing patient (15 Seconds)

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

Participant Comments:

Task Time: ________ Seconds

Optimal Path: Click on Search Bar, enter MRNumber or partial name to search, Click on Lists, click on Medication List, Problem List
- 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 5 Patientthree: Check Lab Results after clearing patient. (15 Seconds)

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

Participant Comments:

Task Time: ________ Seconds

Optimal Path: Click on Search Bar, enter MRNumber or partial name to search, Click on Lab Tab
- Correct
- Minor Deviations / Cycles :: Describe below
- Major Deviations :: Describe below

Comments:
Observed Errors and Verbalizations:
Comments:
Rating:
Overall, this task was: ______

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

Administrator / Notetaker Comments:

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Task 6 Patientthree: Change setting in eRx to display moderate and severe interactions. Add Sulfa allergy. Inactivate the existing medication and then Prescribe Lipitor 10mg Daily (90 Seconds)

Take the participant to the starting point for the task. After reviewing the Lab, you have decided to put this patient on a statin – Lipitor 10mg Daily. Verify that no drug/drug/drug/allergy contraindication exists. Place an order for this medication.
Success:
• Easily completed
• Completed with difficulty or help :: Describe below
• Not completed
Comments:

Task Time: __________ Seconds

Optimal Path: Click on Search Bar, enter MRNumber or partial name to search, Click on Medication List, Edit, Click on Med to inactivate, choose reason, click again to strike out, Click on Allergy drop down, Select Sulfa allergy, Save, Click on eScript icon, Go to Admin Tab, Uncheck box for not showing Moderate interactions, Go to Compose Rx Tab, Search for Lipitor, Select 10mg, Take to Review, select Daily, Save Rx, Continue, If no contraindications proceed to Finish and Add to list, Exit eRx.

• Correct
• Minor Deviations / Cycles :: Describe below
• Major Deviations :: Describe below
Comments:

Observed Errors and Verbalizations:

Comments:

Rating:
Overall, this task was: ______
Show participant written scale: “Very Easy” (1) to “Very Difficult” (5)

Administrator / Notetaker Comments:

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Task 7 PatientThree: Order Abdominal US after clearing patient (60 Seconds)

Success:
• Easily completed
• Completed with difficulty or help :: Describe below
• Not completed
Participant Comments:

Task Time: __________ Seconds

Optimal Path: Click on Search Bar, enter MRNumber or partial name to search, Click on Orders, Click on
Task 8 Patientthree: Check Health Maintenance after clearing patient (30 seconds)

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

Participant Comments:

Task Time: __________ Seconds

Optimal Path: Click on Search Bar, enter MRNumber or partial name to search, Click Yes on Health Maintenance question if it appears, if not Click Health Maintenance menu item, Notice Blood test due. Add glucose screening to Patient CDS set.
• Correct
• Minor Deviations / Cycles :: Describe below
• Major Deviations :: Describe below

Comments:
Observed Errors and Verbalizations:

Rating:
Overall, this task was: ______

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

Administrator / Notetaker Comments:

Task 9 PatientThree: Order Labs – Blood tests Hemoglobin A1C, (30 Seconds)

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

Participant Comments:

Task Time: __________ Seconds
Optimal Path: Click on Orders, Click on diagnosis, Click on Labs Tab, Select HbA1c, Click Oder Pending, Click + sign, Click Send at Top

- 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 (10 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?