2015 EHR Usability Test Report EMA and EMA Mobile

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

Product names: EMA and EMA Mobile

Product version: version 5.10

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EXECUTIVE SUMMARY

A usability test of ambulatory EHR EMA version 5.10 and EMA Mobile version 5.10 was conducted by Modernizing Medicine staff on several dates between November 3rd and 4th, 2017 in person during an annual conference and again for several dates between July 6th and 11th, 2018 in person at the user's medical clinic. 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, a total of 45 healthcare providers and administrators matching the target demographic criteria served as participants and used the EHRUT in simulated, but representative tasks. This study collected performance data on a total of 20 tasks typically conducted on an EHR and presented for certification under the 2015 Edition Certification program.

The test procedures under the certification program are the following:

- 170.315(a)(1) CPOE – Medications
- 170.315(a)(2) CPOE – Laboratory
- 170.315(a)(3) CPOE – Diagnostic Imaging
- 170.315(a)(4) Drug-drug, Drug-allergy Interaction Checks
- 170.315(a)(5) Demographics
- 170.315(a)(6) Problem List
- 170.315(a)(7) Medication List
- 170.315(a)(8) Medication Allergy List
- 170.315(a)(9) Clinical Decision Support
- 170.315(a)(14) Implantable Device List
- 170.315(b)(2) Clinical Information Reconciliation and Incorporation
- 170.315(b)(3) Electronic Prescribing

The tasks presented for usability testing based on the abovementioned test procedure are the following:

1. Use Computerized physician order entry (CPOE) to create a Medication order
2. Use Computerized physician order entry (CPOE) to view and modify a Medication order
3. Use CPOE to create a Lab order ▯
4. Use CPOE to view and modify a Lab order ▯
5. Use CPOE to create a Diagnostic study (Imaging) order ▯
6. Use CPOE to view and modify a Diagnostic study (Imaging) order ▯
7. Record a patient allergy and prescribe a medication that would be contraindicated to that ▯allergy, to get a drug-allergy interaction alert ▯
8. Adjust a drug/drug interaction level ▯
9. Prescribe two medications that are contraindicated to get a drug-drug interaction alert ▯
10. Create a patient and document the following demographics for the patient
11. View and modify patient demographics
12. Review patient's active medications list. ▯
13. Record a new medication. ▯

14. Modify an existing medication.
15. Import a patient's medication history⍰
16. Review patient's allergy list ⍰
17. Record a new allergy ⍰
18. Modify an existing allergy ⍰
19. Record an implantable device for the patient
20. Review and modify an existing record of an implantable device
21. Add an entry to the problem list
22. View and modify an existing problem list entry
23. Prescribe a medication for a patient
24. ePrescribe a medication
25. Cancel an ePrescribed medication
26. View the fill status of a medication
27. Deny a refill request
28. Reconcile the medications, allergies and problems from a received CCDA document into the patient's chart. ⍰
29. Configure clinical decision support Guidelines (as administrator) ⍰
30. Create a clinical decision support guideline based on a lab result
31. Review a clinical decision support guideline and reference information (as a user)
32. View and acknowledge a lab result guideline

A sub-group of the above mentioned tasks were presented to each participant based on their role and the device they were using for testing. The detailed listing of which role was presented with which tasks is discussed in the Tasks section of this document.

All the paperwork (included in Appendices B and C) was discussed and obtained from the participants (TOC, Consent form, Demographics questionnaire).

During usability testing each participant group was greeted by the administrator, the purpose of the study and the process were reviewed with the participant, and they were instructed that they could withdraw at any time. Participants had prior experience with the EHRUT, but not with all of the functionality under test, as some of it was newly developed in the version under test. The administrator introduced the test, and instructed participants to complete a series of tasks (given one at a time) using the EHRUT. During the testing, the administrator timed the test and recorded user performance data on paper and electronically. The administrator did not give the participants assistance in how to complete the task. The contents of the testing orientation were the same for all participants. Participants' use of the EHRUT was recorded for subsequent analysis.

The following types of data were collected for each participant:

- Number of tasks successfully completed without assistance
- Time to complete the tasks
- Number and type 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. 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. Tables 1 and 2 below contain a summary of the performance and rating data collected on the EHRUT for web and iPad based testing.

Table 1: Web-Based Testing Summary

Task ID	Task/ Measure	Task Success Mean	Path Deviation Mean (1 = no deviation, 2= minor deviation, 3 = major deviation)	Task Ratings Mean	Task Failure Mean
A1.1	View Clinical Decision Support Recommendations	100%	3	4.44	0%
A2.1	Use Computerized physician order entry (CPOE) to create a Medication order	100%	3	4.88	0%
A2.2	Use Computerized physician order entry (CPOE) to view and modify a Medication order	89%	3	3.66	11%
A3.1	Use CPOE to create a Lab order	80%	2.65	3.66	20%
A3.2	Use CPOE to view and modify a Lab order	67%	2.35	3.55	33%
A4.1	Use CPOE to create a Diagnostic study (Imaging) order	89%	1.96	4.11	11%

A4.2	Use CPOE to view and modify a Diagnostic study (Imaging) order	89%	1.96	3.66	11%
A5.1	View drug-drug interactions prior to order completion	89%	3	3.11	11%
A5.2	View drug-allergy interactions while generating a medication order	100%	3	3.88	0%
A6.1	Recording active medications	100%	1.5	4.88	0%
A6.2	Modify existing medication records	100%	1.45	4.78	0%
A7.1	Recording active medication allergies	100%	1.36	4.67	0%
A7.2	Viewing and modifying active medication allergy lists	100%	1.23	4.89	0%
A8.1	Adding an implantable device	56%	3	2.71	44%
A8.2	Viewing and modifying an existing implantable device	57%	2.88	2.33	43%
A9.1	Add an entry to the problem list	27%	3	4.44	73%
A9.2	View and modify an existing problem list entry	64%	3	4.45	36%
A10.1	ePrescribe a medication	73%	3	3.73	27%
A10.2	Cancel an ePrescribed medication	45%	3	4.4	55%
A10.3	View the fill status of a medication	64%	3	3.73	36%
A10.4	Deny a refill request	64%	3	3.36	36%
A11.1	Import a patient's medication history	55%	3	4.64	45%
A12.1	View and acknowledge the lab results Guideline	45%	3	4.36	55%

B1.1	Reconcile the medications, allergies and problems from a received CCDA document into the patient's chart.	89%	3	4.11	11%
B2.1	Add and modify the following demographics data: Gender Identity, Sexual Orientation, Preferred Language, Race, Ethnicity, and Ethnic Group	90%	3	N/A	10%
C1.1	Adjust the drug-drug interaction level for a user	64%	3	3.63	36%
C2.1	Create a clinical decision support guideline based on problem list and age	64%	1.86	2.63	36%
C2.2	Create a clinical decision support guideline based on medication and allergy	82%	2.32	3.72	18%
C2.3	Create a clinical decision support guideline based on vital signs and include reference information	91%	1.68	3.63	9%
C2.4	Create a clinical decision support guideline based on a lab result	18%	3	3.1	82%

Table 2: iPad-Based Testing Summary (EMA Mobile)

Task ID	Task / Measure	Task Success Mean	Path Deviation Mean (1 = no deviation, 2= minor deviation, 3 = major deviation)	Task Ratings Mean	Task Failure Mean
A1.1	Use Computerized physician order entry (CPOE) to create a Medication order	100%	3	4.6	0%
A1.2	View and change the medication order	76%	3	3.2	24%
A2.1	Create a Lab order	88%	3	3.8	12%
A2.2	View and modify a Lab order	82%	3	3.8	18%
A3.1	Create a diagnostic study order	76%	3	4.3	24%
A3.2	View and modify a diagnostic study order	76%	3	3.7	24%
A4.1	View drug-drug interventions prior to order completion	94%	3	4.1	6%
A4.2	Viewing drug-allergy interactions	100%	3	4.5	0%
A7.1	Recording active medications	100%	3	4.9	0%
A7.2	Modify an existing medication record	100%	2.87	4.8	0%
A8.1	Record patient's active medication allergy	100%	2.6	4.9	0%
A8.2	View and modify a patient's active medication allergies list	100%	3	4.9	0%
A9.1	Add an entry to the problem list	18%	3	4.45	82%
A9.2	View and modify an existing problem list entry	45%	3	4.45	55%
A10.1	ePrescribe a medication	82%	3	4.36	18%

A10.2	Cancel an ePrescribed medication	82%	2	4.64	18%
A10.3	View the fill status of a medication	55%	3	4.55	45%
A10.4	Deny a refill request	36%	3	3.55	64%
A11.1	Import a patient's medication history	55%	3	4.36	45%
A12.1	View and acknowledge the lab results Guideline	55%	3	4.45	45%
A14.1	Add an Implantable Device to a patient's record	82%	3	2.9	18%
A14.2	Modify an existing Implantable Device	82%	2.28	2.8	18%
B2.1	Reconcile data from a CCD	75%	1.32	3.2	25%

The results from the System Usability Scale scored the subjective satisfaction with the system based on performance with these tasks to be: 61.81 for the web-based application (EMA) and 64.73 for the iPad-based application (EMA Mobile). (calculated based on the Computation of SUS score in Brooke's paper at http://www.usabilitynet.org/trump/documents/Suschapt.doc)

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

Major findings for web-based testing

Positive Findings

- Overall, users found the system easy and intuitive to use.

- Most users stated the features were well designed and will provide benefit in practice.

- Many tasks scored lower than a major deviation.

Areas for improvement

- The workflow of order modification has some areas for improvement to optimize efficiency.

- The workflow of modifying a medication order required an extra step of voiding and creating a new medication order.

- Users struggled with adding and modifying problem list entries

- Tasks that are not routine tended to take more time and were more difficult for participants to complete such as the task for administrators for role configuration.

Major findings for iPad-based testing

<u>Positive Findings</u>

- Many users reported that functions they were familiar with were easy and fast to complete.
- Most of the participants were able to complete all tasks despite taking a less than optimal pathway.

<u>Areas for improvement</u>

- Many tests had large amounts of deviation from the ideal workflow path.
- Users struggled with tasks that were not directly related to their medical specialty.
- A minor software issue caused the implantable device task to be more difficult to complete than expected.
- Several participants felt the test cases could have been better designed to specify a workflow pathway.

INTRODUCTION

The EHRUT tested for this study were EMA, version 5.10, and EMA Mobile, version 5.10. The EHRUT are designed to present medical information to healthcare providers in a medical office in multiple specialties. The EHRUT consists of various modules that provide end-to-end support for administrative and clinical operations of medical practices. The modules include office visit notes, patient chart and medical history charting, electronic prescribing, patient education and clinical decision support, task and result management, billing, scanning, faxing, interfacing with laboratories for receipt of various lab results, providing an online patient portal, MIPS dashboard, and quality measurement. The usability testing attempted to represent realistic exercises and conditions and focused primarily on the set of tasks and measures that are presented for certification under the ONC 2015 certification program and required for the 170.315(g)(3) measure.

The purpose of this study was to test and validate the usability of the current user interface, and provide evidence of usability in the EHRUT. To this end, measures of effectiveness, efficiency and user satisfaction, such as time to complete a task, success rate in completing the task, as well as overall satisfaction rating with the functionality were captured during the usability testing.

METHOD

INTENDED USERS

The intended users for the usability testing of the EHRUT were selected based on their day to day tasks' relevance to the tasks needed to be tested during the usability study. Their demographics, education, years of experience in their position as well as in the use of the EHRUT were considered. The intended users are providers, nurses, medical assistants (MA's), ophthalmic technicians, and administrators (based on the type of tasks needed for testing).

PARTICIPANTS

A total of 55 participants were tested on the EHRUT; 32 tests were performed using the web-based application (EMA) and 34 tests were performed using the iPad application (EMA Mobile). Participants of the test were physicians, nurses, medical assistants, ophthalmic technicians, and administrators from various practices already using and familiar with EMA and EMA Mobile. The usability testing session was performed on a voluntary basis at an annual users conference and on location in medical offices. None of the participants were from the vendor organization, nor did they have any direct connection to the development of the EHRUT.

Recruited participants had a mix of backgrounds and demographic characteristics. The following tables contain details of the participants by characteristics, including demographics, professional experience, and computing experience. Participant names were replaced with Participant IDs so that an individual's data cannot be tied back to individual identities.

Table 3: Web Participant Demographics

	Current Job Title	Current Role	# Years in Role	Age Range	# Years of EMA Usage	# Hours Average EMA Usage
6484840925	MD	MD	11 - 20 years	40-49	3 - 4 years	8
6485249401	MD/owner	MD	6 - 10 years	50-59	5 or more years	10
6485635721	MA	MA	1 - 5 years	40-49	Less than 1 year	8
6484811783	Medical Assistant	MA	1 - 5 years	20-29	Less than 1 year	8
6485623175	Clinical Supervisor and EMA Trainer	MA	1 - 5 years	20-29	1 - 2 years	9
6485410158	Site Supervisor	MA	1 - 5 years	20-29	1 - 2 years	9
6485275499	Medical assistant	MA	6 - 10 years	20-29	3 - 4 years	7

6484925677	Medical assistant	MA	6 - 10 years	30-39	5 or more years	10
6485087497	Medical assistant	MA	11 - 20 years	30-39	1 - 2 years	8
6484835952	Office Manager	Administrative	Less than 1 year	40-49	Less than 1 year	6
6484879584	Front office manager	Administrative	Less than 1 year	40-49	Less than 1 year	8
6484908960	Billing Specialist/Compliance	Administrative	1 - 5 years	20-29	Less than 1 year	7
6485150692	Office Manager	Administrative	1 - 5 years	20-29	1 - 2 years	6
6485140209	Office Practice Manager	Administrative	1 - 5 years	50-59	1 - 2 years	8
6485134317	Scheduling Supervisor	Administrative	1 - 5 years	20-29	1 - 2 years	8
6484996665	Administrative Assistant	Administrative	1 - 5 years	30-39	1 - 2 years	5
6485057535	Center Director	Administrative	11 - 20 years	40-49	1 - 2 years	1
6485782960	IT	Administrative	11 - 20 years	40-49	3 - 4 years	10
6485133491	Billing Manager	Administrative	11 - 20 years	50-59	1 - 2 years	3
6484991907	Practice Manager	Administrative	More than 20 years	60-74	1 - 2 years	5
6500000000	Medical Assistant	MA	6-10 years	30-39	5 or more years	8
ES01	Ophthalmic Technician	technician	1 - 5 years	30-39	Less than 1 year	8
ES02	Site Coordinator	Administrative	1 - 5 years	50-59	3 - 4 years	2
ES03	ophthalmic technician	technician	More than 20 years	60-74	3 - 4 years	8
ES05	ophthalmic technician	technician	Less than 1 year	20-29	Less than 1 year	8
ES08	ophthalmic assistant	technician	1 - 5 years	20-29	1 - 2 years	8
ES09	ophthalmic tech	MA	11 - 20 years	50-59	1 - 2 years	8

DG01	COMT	technician	1 - 5 years	40-49	3 - 4 years	7
DG02	medical assistant	MA	1 - 5 years	20-29	3 - 4 years	8
DG04	CCMA/CST	MA	1 - 5 years	30-39	3 - 4 years	8
DG06	Medical Assistant	MA	6 - 10 years	30-39	1 - 2 years	8
DG07	LPN	MA	More than 20 years	60-74	5 or more years	9

Table 4: iPad Participant Demographics

	Current Job Title	Current Role	# Years in Role	Age Range	# Years of EMA Usage	# Hours Average EMA Usage
6485074585	Otolaryngologist	MD	Less than 1 year	50-59	Less than 1 year	5 - 6 hours
6484840925	MD	MD	11 - 20 years	40-49	3 - 4 years	5 - 6 hours
6485249401	MD/owner	MD	6 - 10 years	50-59	5 or more years	More than 8 hours
6484820483	Dermatologist	MD	More than 20 years	60-74	5 or more years	More than 8 hours
6484840925	MD	MD	11 - 20 years	40-49	3 - 4 years	More than 8 hours
6484900512	Physician Assistant	PA	1 - 5 years	20-29	1 - 2 years	1 - 2 hours
6485336293	Physician Assistant	PA	1 - 5 years	30-39	1 - 2 years	More than 8 hours
6485054885	Physician Assistant	PA	6 - 10 years	30-39	3 - 4 years	3 - 4 hours
6485635721	MA	MA	1 - 5 years	40-49	Less than 1 year	6 - 7 hours
6484811783	Medical Assistant	MA	1 - 5 years	20-29	Less than 1 year	6 - 7 hours
6485623175	Medical Assistant	MA	1 - 5 years	20-29	1 - 2 years	6 - 7 hours
6485581484	Assistant Clinical Coordinator	MA	1 - 5 years	30-39	1 - 2 years	More than 8 hours
6484894537	RMA	MA	1 - 5 years	30-39	3 - 4 years	6 - 7 hours

6484831151	Medical Assistant	MA	1 - 5 years	30-39	3 - 4 years	6 - 7 hours
6485327583	Clinic Assistant	MA	6 - 10 years	40-49	1 - 2 years	6 - 7 hours
6485691664	CMA	MA	6 - 10 years	30-39	1 - 2 years	6 - 7 hours
6484826412	MA	MA	6 - 10 years	20-29	1 - 2 years	6 - 7 hours
6485327583	Clinic Assistant	MA	6 - 10 years	40-49	1 - 2 years	6 - 7 hours
6485691664	MA	MA	6 - 10 years	30-39	1 - 2 years	6 - 7 hours
6485275499	MA	MA	6 - 10 years	20-29	3 - 4 years	More than 8 hours
6485731801	MA	MA	6 - 10 years	30-39	5 or more years	5 - 6 hours
6484925677	MA	MA	6 - 10 years	30-39	5 or more years	1 - 2 hours
6484829070	MA	MA	11 - 20 years	30-39	5 or more years	3 - 4 hours
6484876153	MA	MA	More than 20 years	30-39	5 or more years	More than 8 hours
ES01	Ophthalmic Technician	Technician	1 - 5 years	30-39	Less than 1 year	n/a
ES02	Site Coordinator	Administrative	1 - 5 years	50-59	3 - 4 years	n/a
ES03	ophthalmic technician	Technician	More than 20 years	60-74	3 - 4 years	n/a
ES05	ophthalmic technician	Technician	Less than 1 year	20-29	Less than 1 year	1 - 2 hours
ES08	ophthalmic assistant	Technician	1 - 5 years	20-29	1 - 2 years	6 - 7 hours
ES09	ophthalmic tech	MA	11 - 20 years	50-59	1 - 2 years	n/a
DG01	COMT	Technician	1 - 5 years	40-49	3 - 4 years	1 - 2 hours
DG02	medical assistant	MA	1 - 5 years	20-29	3 - 4 years	5 - 6 hours
DG04	CCMA/CST	MA	1 - 5 years	30-39	3 - 4 years	6 - 7 hours
DG06	Medical Assistant	MA	6 - 10 years	30-39	1 - 2 years	More than 8 hours
DG07	LPN	MA	More than 20 years	60-74	5 or more years	More than 8 hours

A spreadsheet was used to keep track of the participant schedule, and included each participant's demographic characteristics. Additional demographic data is available in appendix A.

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 these tests 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 can be made.

During the usability test, participants interacted with one EHR. Each participant used the EHRUT from either a computer (EMA) or an iPad (EMA Mobile) and was provided with the same instructions. The EHRUT was evaluated for effectiveness, efficiency and satisfaction as defined by measures collected and analyzed for each participant:

• Number of tasks successfully completed 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 the section 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 within the EHR, and were representative of the functionality presented for certification for the 2015 Advancing Care Information program, including:

1. Use Computerized physician order entry (CPOE) to create a Medication order
2. Use Computerized physician order entry (CPOE) to view and modify a Medication order
3. Use CPOE to create a Lab order ⏺
4. Use CPOE to view and modify a Lab order ⏺
5. Use CPOE to create a Diagnostic study (Imaging) order ⏺
6. Use CPOE to view and modify a Diagnostic study (Imaging) order ⏺
7. Record a patient allergy and prescribe a medication that would be contraindicated to that ⏺allergy, to get a drug-allergy interaction alert ⏺
8. Adjust a drug/drug interaction level ⏺
9. Prescribe two medications that are contraindicated to get a drug-drug interaction alert ⏺
10. Create a patient and view and modify demographics data.
11. Review patient's active medications list. ⏺

12. Record a new medication. ⍰
13. Modify an existing medication.
14. Import a patient's medication history⍰
15. Review patient's allergy list ⍰
16. Record a new allergy ⍰
17. Modify an existing allergy ⍰
18. Record an implantable device for the patient
19. Review and modify an existing record of an implantable device
20. Add an entry to the problem list
21. View and modify an existing problem list entry
22. Prescribe a medication for a patient
23. ePrescribe a medication
24. Cancel an ePrescribed medication
25. View the fill status of a medication
26. Deny a refill request
27. Reconcile the medications, allergies and problems from a received CCDA document into the patient's chart. ⍰
28. Configure clinical decision support Guidelines (as administrator) ⍰
29. Create a clinical decision support guideline based on a lab result
30. Review a clinical decision support guideline and reference information (as a user)
31. View and acknowledge a lab result guideline

The tasks were selected based on the measures presented for certification in the ONC 2015 Edition program and required for Test Procedure §170.315(g)(3) Safety-enhanced design. These tasks are also representative of some of the most commonly performed tasks by the personnel recruited for participation.

The following is a breakdown of the tasks that were presented to the users based on their role. A subset of each set of tasks were presented based on the device the participant was testing on.

Physician

1. View and acknowledge a clinical decision support guideline
2. Create an order for a medication
3. View and change an existing medication order
4. Create a lab order
5. View and modify an existing lab order
6. Create an order for a diagnostic study
7. View and modify an existing diagnostic study order
8. View drug-drug interactions prior to order completion
9. View drug-allergy interactions
10. Record active medications
11. View and modify existing medication records
12. Record active allergies
13. View and modify an active medication allergy list

14. Record an implantable device
15. Modify an existing implantable device

Nurse/Medical Assistant

1. View and acknowledge a clinical decision support guideline
2. View and acknowledge a lab results guideline
3. Create an order for a medication
4. View and change an existing medication order
5. ePrescribe a medication
6. Cancel an ePrescribed medication
7. View the fill status of a medication
8. Deny a refill request
9. Create a lab order
10. View and modify an existing lab order
11. Create an order for a diagnostic study
12. View and modify an existing diagnostic study order
13. View drug-drug interactions prior to order completion
14. View drug-allergy interactions
15. Record active medications
16. View and modify existing medication records
17. Import a patient's medication history
18. Record active allergies
19. View and modify an active medication allergy list
20. Add an entry to the problem list
21. View and modify an existing problem list entry
22. Reconcile and import data from a CCD
23. Record an implantable device
24. Modify an existing implantable device
25. Create a clinical decision support guideline based on a lab result
26. View and modify demographics data

Administrator

1. Adjust a drug-drug interaction level for a user
2. Create a clinical decision support guideline for a problem list item and age
3. Create a clinical decision support guideline for medication and allergy
4. Create a clinical decision support guideline for vital signs with bibliographic and reference information

PROCEDURES

Upon arrival to the testing sessions, 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 had reviewed and signed an informed consent and release form prior to the study (See Appendix C). Attendees were then directed to either a computer or iPad depending on the test they would be performing that day.

The administrators 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.

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.

Task timing began once the user clicked begin task and received the instructions. The task time was stopped once the participant indicated they had finished the task. Scoring is discussed below in the Data Scoring section.

Following the session, the administrator gave the participant the post-test System Usability Scale questionnaire (see Appendix E), and thanked each individual for their participation. After completion of the questionnaire, participants were given compensation. Participants then signed a receipt and acknowledgement form (See Appendix F) indicating that they had received compensation 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

Participants were tested either in small groups onsite at an annual user conference in a quiet conference room or onsite at their medical practice.

All participants were provided a computer or iPad to facilitate testing. The administrator and the participants were the only people present in the testing room. The testing session was recorded for further analysis.

TEST ENVIRONMENT

Participants used a mouse and keyboard when interacting with the EHRUT for the web-based testing and their hands for the iPad-based testing. For web-based testing, users were logged in to

a test server as the testing was being performed on an unreleased version. For iPad-based testing, users were logged into the same test server on an unreleased version of the iPad application.

For web-based testing, EMA was set up using the recommended web browser at a recommended screen resolution. System performance and speed was similar to what users would experience in an actual implementation. Participants were unable to change any system settings such as font size or automatic logout interval.

For iPad-based testing, the EMA Mobile application was used on each iPad. Though the application was an unreleased version, the overall performance was similar to the current, live version of the software. Similar to the web-based testing, users were unable to change any system settings for the iPad application.

For both instances of testing, Loop11 was used to record the testing session as well as to capture user ratings and comments. This software was also used to provide participants with task instructions as well as monitoring when a task had been completed.

TEST FORMS AND TOOLS

During the usability test, various documents and instruments were used, including: 1. Informed Consent and Non-Disclosure Agreement (Appendix C); 2. Moderator's Guide (Appendix D); 3. Post-test System Satisfaction Questionnaire (Appendix E); and 4. Incentive Receipt and Acknowledgment Form (Appendix F).

Examples of these documents can be found in abovementioned Appendices. The Moderator's Guide was devised so as to be able to capture required data and ensure consistent approach and process across all the testing sessions.

The participant's interaction with the EHRUT was captured and recorded digitally with screen capture software (Loop11) running on each device used in testing. The test sessions were recorded and analyzed at a later time.

PARTICIPANT INSTRUCTIONS

The administrator read the following instructions aloud to each group of participants (also see the full moderator's guide in Appendix D):

> Thank you for participating in this study.
>
> Today you will be asked to complete a series of tasks designed to assess the usability of EMA. We are in no way testing your abilities and welcome any feedback that you have to make EMA easier to use.
>
> Try your best to complete each task. If you get stuck and are unsure how to complete the task, please abandon the task and move onto the next task.

If you do not understand the task, I can try to explain what you are required to do, but I cannot offer assistance to help you complete the task.

All of the information that you provide today will be kept confidential and your name will not be associated with your comments and overall test results at any time.

Do you have any questions or concerns before getting started?

Participants were then directed to follow the set of instructions presented on Loop11 to then attempt the list of tasks specific to their role.

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 EMA and EMA Mobile by measuring participant success rates and errors

2.   Efficiency of EMA and EMA Mobile by measuring the average task time and path deviations

3.   Satisfaction with EMA and EMA Mobile by measuring ease of use ratings

DATA SCORING

A task was counted as a "Success" if the participant was able to achieve the correct outcome, without assistance. 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.

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. The task deviations were rated on the scale of 1 = no deviations, 2 = minor deviations, 3 = major deviations

Each task was timed from when the user clicked "Begin Task" until the participant clicked "Task Complete." 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.

Optimal task performance time, as benchmarked by expert performance under realistic conditions, was recorded when constructing tasks. Target/optimal task times were defined by taking multiple measures of optimal performance and multiplying by a factor of 1.45 to allow for some time buffer because the participants are presumably not trained to expert performance.

Observed task times divided by the optimal time for each task was used as a measure of optimal efficiency.

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 per task.

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 EMA and EMA Mobile overall, the testing team administered the System Usability Scale (SUS) post-test questionnaire that included questions like "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 E.

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 task relevant data excluded from the analyses. The only exclusions were made for individual tasks and not for an entire study.

The usability testing results for the EHRUT are detailed below in tables 5 and 6. The results should be seen in light of the objectives and goals outlined in Study Design section.

Table 5: Web-based Usability Testing Results

Task ID	Task Success	Path Deviation Mean	Observed Task Time Mean (seconds)	Optimal Task Time Mean	Task Ratings Mean
A1.1	View Clinical Decision Support Recommendations	3	337.44	6	4.44
A2.1	Use Computerized physician order entry (CPOE) to create a	3	104	48	4.88

	Medication order				
A2.2	Use Computerized physician order entry (CPOE) to view and modify a Medication order	3	113	32	3.66
A3.1	Use CPOE to create a Lab order	2.65	151	22	3.66
A3.2	Use CPOE to view and modify a Lab order	2.35	45	19	3.55
A4.1	Use CPOE to create a Diagnostic study (Imaging) order	1.96	75.44	22	4.11
A4.2	Use CPOE to view and modify a Diagnostic study (Imaging) order	1.96	72.33	17	3.66
A5.1	View drug-drug interactions prior to order completion	3	173.5	39	3.11
A5.2	View drug-allergy interactions while generating a medication order	3	101.5	43	3.88
A6.1	Recording active medications	1.5	55.22	26	4.88
A6.2	Modify existing medication records	1.45	34.55	9	4.78
A7.1	Recording active medication allergies	1.36	34	18	4.67
A7.2	Viewing and modifying active medication allergy lists	1.23	23.55	5	4.89
A8.1	Adding an implantable device	3	77.88	41	2.71
A8.2	Viewing and modifying an existing implantable device	2.88	65.14	20	2.33
A9.1	Add an entry to the problem list	4.6	74.3	3	4.45
A9.2	View and modify an existing problem list	4.78	85.5	42	4.55

	entry				
A10.1	ePrescribe a medication	15.45	214	24	3.73
A10.2	Cancel an ePrescribed medication	8.3	138.4	23	4.4
A10.3	View the fill status of a medication	7.1	147.9	18	3.73
A10.4	Deny a refill request	10.4	159.45	76	3.36
A11.1	Import a patient's medication history	4.91	94.36	22	4.64
A12.1	View and acknowledge the lab results Guideline	3.73	103	22	4.36
B1.1	Reconcile the medications, allergies and problems from a received CCDA document into the patient's chart.	3	77.22	9	4.11
B2.1	Add and modify the following demographics data: Gender Identity, Sexual Orientation, Preferred Language, Race, Ethnicity, and Ethnic Group	3	236	57	N/A
C1.1	Adjust the drug-drug interaction level for a user	3	225	11	3.63
C2.1	Create a clinical decision support guideline based on problem list and age	1.86	291	43	2.63
C2.2	Create a clinical decision support guideline based on medication and allergy	2.32	163	28	3.72
C2.3	Create a clinical decision support guideline based on vital signs and include reference information	1.68	184	52	3.63
C2.4	Create a clinical decision support guideline based on a lab result	18%	3	3.1	82%

Table 6: iPad-based Usability Testing Results

Task ID	Task Success	Path Deviation Mean	Observed Task Time Mean (seconds)	Optimal Task Time Mean (seconds)	Task Ratings Mean
A1.1	Use Computerized physician order entry (CPOE) to create a Medication order	3	122	40	4.6
A1.2	View and change the medication order	3	122	37	3.2
A2.1	Create a Lab order	3	179	15	3.8
A2.2	View and modify a Lab order	3	147	19	3.8
A3.1	Create a diagnostic study order	3	161	31	4.3
A3.2	View and modify a diagnostic study order	3	184	13	3.7
A4.1	View drug-drug interventions prior to order completion	3	255	36	4.1
A4.2	Viewing drug-allergy interactions	3	277	44	4.5
A7.1	Recording active medications	3	218	28	4.9
A7.2	Modify an existing medication record	2.87	213	10	4.8
A8.1	Record patient's active medication allergy	2.6	235	13	4.9
A8.2	View and modify a patient's active medication allergies list	3	230	4	4.9
A9.1	Add an entry to the problem list	6.36	74	25	4.45
A9.2	View and modify an existing problem list entry	4.27	57	23	4.45
A10.1	ePrescribe a medication	13.55	115	54	4.36
A10.2	Cancel an ePrescribed	6.36	55	4	4.64

	medication				
A10.3	View the fill status of a medication	6.91	99	3	4.55
A10.4	Deny a refill request	13.27	89	30	3.55
A11.1	Import a patient's medication history	7.18	93	24	4.36
A12.1	View and acknowledge the lab results Guideline	3.55	80	14	4.45
A14.1	Add an Implantable Device to a patient's record	3	367	27	2.9
A14.2	Modify an existing Implantable Device	2.28	312	8	2.8
B2.1	Reconcile data from a CCD	1.32	37	40	3.2

The results from the SUS (System Usability Scale) scored the subjective satisfaction with the system based on performance with these tasks to be 61.81 on the web-based version and 64.73 on the iPad-based version. Broadly interpreted, scores under 60 represent systems with poor usability; scores over 80 would be considered above average.

DISCUSSION OF THE FINDINGS

The major areas of focus in the test had to deal with the tasks supporting the 2015 Edition CEHRT requirements. Overall, the areas tested revolved around CPOE, electronic prescribing, drug/drug/allergy interactions and clinical decision support. The study demonstrated that the majority of the tasks were completed successfully with little to no deviations. The task ratings indicated that most of the users found the tasks easy to perform (1 or 2 on a 1 to 5 scale, 1 being easy). The verbal comments and feedback regarding the areas of improvement also aligned with the statistical data presented by the task time deviations, task success and ratings.

EFFECTIVENESS

Based on the success, failure and path deviation data, the majority of participants were able to complete the tasks with some difficulty. The path deviation data shows that the majority of users were able to complete the specified tasks using an alternative workflow.

Tasks performed on the web that caused minor to significant difficulty included:

- Viewing drug-drug interactions prior to order completion
- Recording an implantable device
- Creating a clinical decision support guideline

Tasks performed on the iPad that caused minor to significant difficulty included:

- The ability to import clinical data from a Continuity of Care Document (CCD).
- The ability to change medication and diagnostic orders as users are required to delete the existing order.
- The ability to address an incoming refill request.

EFFICIENCY

Based on the observations of the task time and deviation data, most of the tasks took a fair bit of time longer for participants to complete as compared to expert performance. This indicates that there is room for improvement in the efficiency of the application. Some discounting must be made for the psychological state of mind of the participants as well as overall familiarity with the portions of the application being tested.

SATISFACTION

Based on the task ratings and SUS results data, users found routine tasks to be friendly and easy to use while less-routine tasks were found to be less simple to learn and understand. This coincides with many of the user comments described below. The SUS rating of the web-based application and functionality under test was 61.81 while the rating for the iPad application was 64.73.

MAJOR FINDINGS

Overall, the majority of the participants identified the application as user friendly, easy to use, easy to learn. They indicated that the EHRUT is consistent across various versions, which makes it easier to adjust to new releases and learn the new functionality quickly.

Observations that are specific to testing while using the web-based system include:

- Administrators struggled more with their assigned tasks than most other users.
- Though all users were able to view a clinical decision support guideline, they took unnecessary steps to do so.

Observations that are specific to testing while using the iPad application include:

- There were large deviations from ideal workflow pathways.
- Most users discovered how to import implantable devices, but many struggled with the scanning feature to do so.

Key observations that were common to both sets of testing were:

- Users excel at recording past medical history data within the system.

- The workflows for creating and modifying a medication order had a higher than normal amount of deviations as it is possible to modify a medication order through multiple pathways.

- Changing diagnostic studies slowed many users down as it requires removing the initially selected order and creating a new one.

- Tasks that are not routine tended to take more time and were more difficult for participants to complete. In particular the administrators struggled with the tasks assigned to them as most of the features in this portion of the application are configured one time only.

- Adding and modifying problem list entries most likely caused frustration because the system automates most of the problem recording, meaning users are unfamiliar with the feature.

Participant-specific positive comments included:

- "Knew how to accomplish most of the tasks. Very easy to use"

- "Most task[s] were very well laced out. However, the reconcile from ccd [functionality] which I have never performed was difficult and I was not able to complete the task. However, I have never been taught to use it. A quick lesson would most likely allow me to remember. Most EMA task[s] are easy to remember after being taught once"

- "Having never seen Guidelines before, I was afraid I had been missing out on something I needed to do for my practice. After the 1st task, I quickly grasped the process and feel very confident setting up guidelines for our providers. I can see a lot of usefulness in this."

- "I am new to EMA (9 months) and felt that with the minimal instruction I was able to figure out the concept but would need further training on how it integrates with the back office flow."

- "EMA is easy to navigate more so on an iPad than laptop or computer."

Participant's specific concerns included:

- "If [testing] was more dermatology related I think I would be better at it."

- "Little confusion on the guideline properties."

- "Modification of medications could be easier from outside a visit note in the RX tab."

AREAS FOR IMPROVEMENT

Some of the common areas for improvement were identified based on the comments from the participants, as well as from the observations of user interaction with the system in the performance of specific tasks, and based on the analysis of path deviations, task success and ratings, as well as comparative analysis of average task time to the "optimal" task time. Those areas included:

- As the software intentionally allows for multiple workflow pathways, task design for future tests need to be more specific to get an accurate measure of usability.

- The error which slowed users down while adding implantable devices was addressed shortly after the testing session, but future care must be made to ensure there are no issues with features being tested.

- Educational materials need to be available to users to allow for a greater understanding of the features of the EHRUT and enhance user workflow.

As the EHRUT focuses only on medical subspecialties, tasks should be designed in a way to allow subsets of users to test features and functionalities that are relevant to their medical specialty.
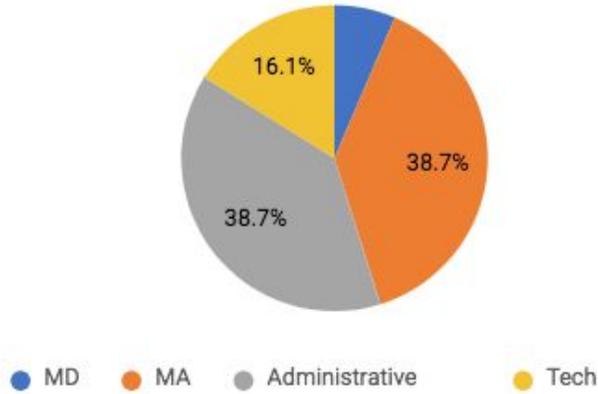
APPENDICES

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

A.   Participant demographics

B.   Participant demographics questionnaire

C.   Non-Disclosure Agreement (NDA) and Informed Consent Form

D.   Moderator's Guide

E.   System Usability Scale Questionnaire

F.   Acknowledgement of Incentive Receipt
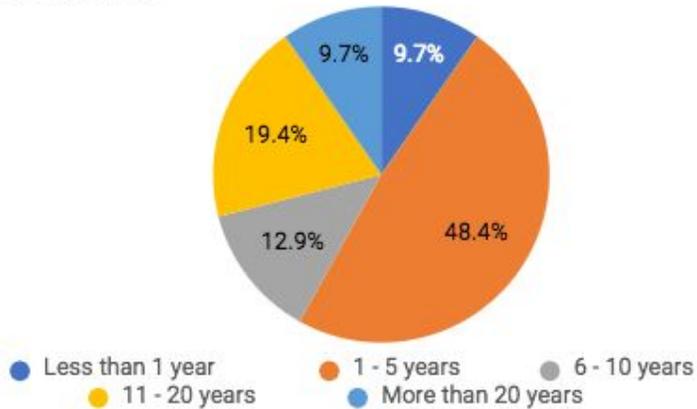
Appendix A PARTICIPANT DEMOGRAPHICS

Following is a high-level overview of the participants in the web-based study.
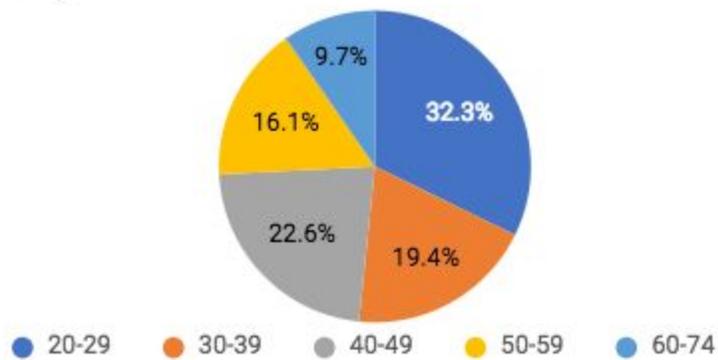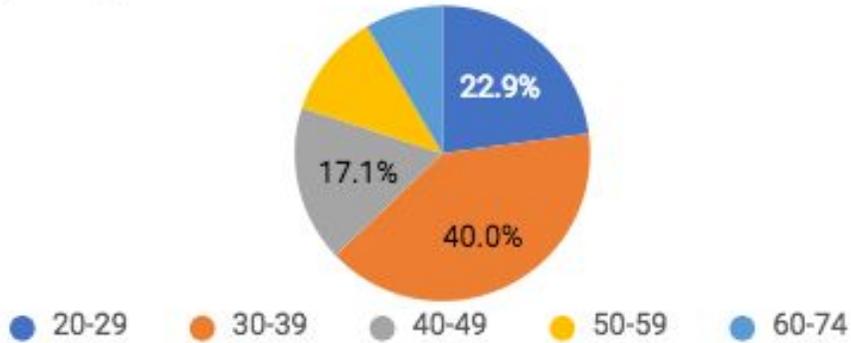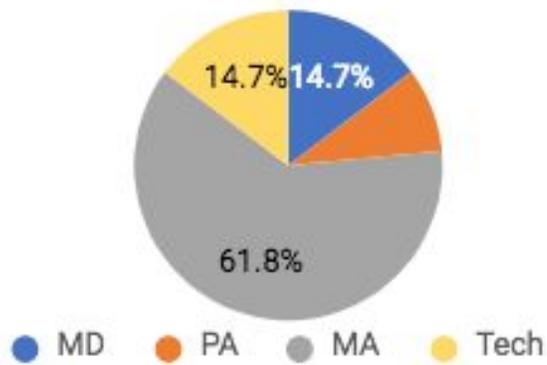
Current Role

MD ● MA ● Administrative ● Tech ●

- MD
- MA — 38.7%
- Administrative — 38.7%
- Tech — 16.1%

Years in Role

- Less than 1 year — 9.7%
- 1 - 5 years — 48.4%
- 6 - 10 years — 12.9%
- 11 - 20 years — 19.4%
- More than 20 years — 9.7%

Age Range

- 20-29 — 32.3%
- 30-39 — 19.4%
- 40-49 — 22.6%
- 50-59 — 16.1%
- 60-74 — 9.7%

The following are high level overviews of the demographics of participants in the iPad-based study

Age Range

- 20-29
- 30-39
- 40-49
- 50-59
- 60-74

(22.9%, 40.0%, 17.1%)

Current Role

- MD
- PA
- MA
- Tech

(14.7%, 14.7%, 61.8%)

Years in Role

- Less than 1 year
- 1 - 5 years
- 6 - 10 years
- 11 - 20 years
- More than 20 years

(13.9%, 38.9%, 30.6%)
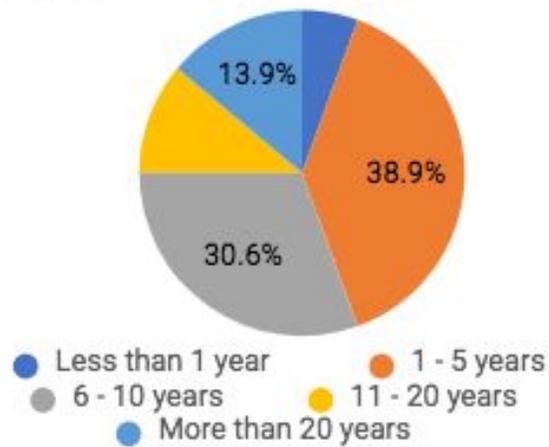
Table 7: Additional Demographic Data for Web-based Testing Participants

Participant Identifier	Participant Gender	Participant Education
6484840925	Male	Doctorate degree (e.g., MD, DNP, DMD, PhD)
6485249401	Female	Doctorate degree (e.g., MD, DNP, DMD, PhD)
6485635721	Female	High school graduate, diploma or the equivalent (for example: GED)
6484811783	Female	Associate degree
6485623175	Female	Bachelor's Degree
6485410158	Female	Associate degree
6485275499	Female	Associate degree
6484925677	Female	Associate degree
6485087497	Female	Associate degree
6484835952	Female	Master's Degree
6484879584	Female	High school graduate, diploma or the equivalent (for example: GED)
6484908960	Female	Master's Degree
6485150692	Female	Master's Degree
6485140209	Female	Master's Degree
6485134317	Female	High school graduate, diploma or the equivalent (for example: GED)
6484996665	Female	High school graduate, diploma or the equivalent (for example: GED)
6485057535	Female	Master's Degree
6485782960	Male	Bachelor's Degree
6485133491	Female	Associate degree
6484991907	Female	Bachelor's Degree
6500000000	Female	Associate degree
ES01	Female	Associate degree
ES02	Female	Associate degree
ES03	Female	Associate degree
ES05	Female	Associate degree
ES08	Female	Associate degree
ES09	Female	Associate degree
DG01	Female	Bachelor's Degree
DG02	Female	Associate degree
DG04	Female	Associate degree
DG06	Female	High school graduate, diploma or the equivalent (for example: GED)
DG07	Female	Associate degree

Table 8: Additional Demographic Data for iPad-based Testing Participants

Participant ID	Participant Gender	Participant Education
P1	Male	M.D.
P2	Male	M.D.
P3	Female	M.D.
P4	Male	M.D.
P5	Male	M.D.
P6	Female	Master's
P7	Female	Master's
P8	Female	Master's
P9	Female	High School
P10	Female	Associate's/Vocational
P11	Female	Bachelor's
P12	Female	Associate's/Vocational
P13	Female	Associate's/Vocational
P14	Female	Associate's/Vocational
P15	Female	Associate's/Vocational
P16	Female	Associate's/Vocational
P17	Female	Associate's/Vocational
P18	Female	Associate's/Vocational
P19	Female	Associate's/Vocational
P20	Female	Associate's/Vocational
P21	Female	Bachelor's
P22	Female	Associate's/Vocational
P23	Female	Associate's/Vocational
P24	Female	Associate's/Vocational

Appendix B PARTICIPANT DEMOGRAPHICS QUESTIONNAIRE

Please complete the following information:

Age Range

- 20-29, 30-39, 40-49, 50-59, 60-74, 75 and older

Current Role

- MD, RN, MA, Ophthalmic Tech, Administrative, Other

Current Job Title

Number of Years in Role?

- 1-5 years, 6-10 years, 11-20 years, More than 20 years

Number of Years of EMA Usage

- Less than 1 year, 1-2 years, 3-4 years, 5 or more years

Average Number of Hours of EMA Use per Day

Appendix C NON-DISCLOSURE AGREEMENT (NDA)

THIS NONDISCLOSURE AGREEMENT (this "Agreement") is made and entered into as of the date last signed below between Modernizing Medicine, Inc., a Delaware corporation ("Company"), and the undersigned designated as the "Recipient" on the signature page hereto ("Recipient").

1. Purpose. Recipient desires to participate in a usability study being conducted by Company and in connection with this study, Company may disclose to Recipient certain confidential technical and business information, which Company desires Recipient to treat as confidential.

2. "Confidential Information" means any information disclosed to Recipient by Company, either directly or indirectly in writing, orally or by inspection of tangible objects. Confidential Information may also include information disclosed to Company by third parties. Confidential Information shall not, however, include any information which Recipient can establish (i) was publicly known and made generally available in the public domain prior to the time of disclosure to Recipient by Company; (ii) becomes publicly known and made generally available after disclosure to Recipient by Company through no action or inaction of Recipient; or (iii) is in the possession of Recipient, without confidentiality restrictions, at the time of disclosure by Company as shown by Recipient's files and records immediately prior to the time of disclosure.

3. Non-use and Non-disclosure. Recipient agrees not to use any Confidential Information for any purpose except to participate in the Company's usability study. Recipient agrees not to disclose any Confidential Information to third parties. Recipient shall not reverse engineer, disassemble or decompile any prototypes, software or other tangible objects which embody Company's Confidential Information and which are provided to Recipient hereunder.

4. Maintenance of Confidentiality. Recipient agrees that it shall take all reasonable measures to protect the secrecy of and avoid disclosure and unauthorized use of the Confidential Information. Recipient shall not make any copies of Confidential Information unless the same are previously approved in writing by the Company. Recipient shall immediately notify Company in the event of any unauthorized use or disclosure of the Confidential Information.

5. No Obligation. Nothing herein shall obligate Company or Recipient to proceed with any transaction between them.

6. No Warranty. ALL CONFIDENTIAL INFORMATION IS PROVIDED "AS IS." COMPANY MAKES NO WARRANTIES, EXPRESS, IMPLIED OR OTHERWISE, REGARDING ITS

ACCURACY, COMPLETENESS OR PERFORMANCE.

7. Return of Materials. All documents and other tangible objects containing or representing Confidential Information and all copies thereof which are in the possession of Recipient shall be and remain the property of Company and shall be promptly returned to Company upon Company's request.

8. No License. Nothing in this Agreement is intended to grant any rights to Recipient under any patent, mask work right, trademark, copyright or other intellectual property right of Company, nor shall this Agreement grant Recipient any rights in or to Confidential Information except as expressly set forth herein.

9. Term. This Agreement shall survive until such time as all Confidential Information disclosed hereunder becomes publicly known and made generally available through no action or inaction of Recipient.

10. Remedies. Recipient agrees that any violation or threatened violation of this Agreement will cause irreparable injury to the Company, entitling Company to obtain injunctive relief in addition to all legal remedies.

11. Recipient Information. Company does not wish to receive any confidential information from

Recipient, and Company assumes no obligation, either express or implied, with respect to any information disclosed by Recipient.

12. Miscellaneous. This Agreement shall bind and inure to the benefit of the parties hereto and their successors and assigns. This Agreement shall be governed by the laws of the State of Florida, without reference to conflict of laws principles. This document contains the entire agreement between the parties with respect to the subject matter hereof. Any failure to enforce any provision of this Agreement shall not constitute a waiver thereof or of any other provision hereof. This Agreement may not be amended, nor any obligation waived, except by a writing signed by both parties hereto.

MODERNIZING MEDICINE, INC.   RECIPIENT

By: _____   By: _____

Name: _____   Name: _____

Title: _____   Date: _____

Date: _____

INFORMED CONSENT FORM

Modernizing Medicine, Inc. would like to thank you for participating in this study. The purpose of this study is to evaluate Modernizing Medicine's electronic health records system - EMA. If you decide to participate, you will be asked to perform several tasks using the application and give your feedback. The study will last about 60 minutes.

Agreement

I understand and agree that as a voluntary participant in the present study conducted by Modernizing Medicine, Inc. I am free to withdraw consent or discontinue participation at any time. I understand and agree to participate in the study conducted and recorded by Modernizing Medicine. I understand and consent to the use and release of the recordings by Modernizing Medicine.

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 Modernizing Medicine 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 Modernizing Medicine.

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 D MODERATOR'S GUIDE ON CONDUCTING THE USABILITY TEST FOR EMA VERSION 5.10 AND EMA MOBILE VERSION 5.10

Prior to test

- Ensure EMA environment is currently loaded (iPad only).
- Logout of environment from previous user.
- Have participant complete demographic questionnaire (if not completed prior).
- Check participant off the list. If they are a walk-in, then write them in.
- For walk-ins: confirm role. They must be a current EMA user and NOT in a billing, front desk or compliance role.
- Have participant sign the informed consent and NDA forms.

During the test

- Explain testing procedure using script.
- Load Loop11 test link.
- Log user into test environment.
- Provide task reference sheet (iPad only).
- Start recording (iPad only).

After the test

- Stop recording (iPad only).
- Confirm Loop11 test is completed.
- Give participant gift card and have them sign receipt.

Orientation

Thank you for participating in this study.

Today you will be asked to complete a series of tasks designed to assess the usability of EMA. We are in no way testing your abilities and welcome any feedback that you have to make EMA easier to use.

Try your best to complete each task. If you get stuck and are unsure how to complete the task, please abandon the task and move onto the next task.

If you do not understand the task, I can try to explain what you are required to do, but I cannot offer assistance to help you complete the task.

All of the information that you provide today will be kept confidential and your name will not be associated with your comments and overall test results at any time.

Do you have any questions or concerns before getting started?

Tasks are administered via Loop11 application.

Final Questions (5 Minutes)

- What is your overall impression of the functionality under test?
- What is your overall impression of the system?
- What aspects of the system do you like most?
- What aspects of the system do you like least?
- Compare this system to other systems you have used (if any)

Provider Tasks

1	View Clinical Decision Support recommendations	View your test patient and review the recommendations provided within the Guideline. Dismiss the alert for the rest of the day.
2	Create an order for a medication	Prescribe Medication: Omeprazole 20 mg, quantity 30 tablets with 1 refill with the sig "take one by mouth once daily."
3	View and change the medication order	View the medication and modify the order to Omeprazole 40: quantity 30 tablets with 1 refill with the sig "take one by mouth once daily."
4	Create a Lab order	Add the following Laboratory Order: Cholesterol in HDL [Mass/volume] in Serum or Plasma
5	View and modify a Lab order	View the Lab order and change Cholesterol in HDL to Cholesterol in LDL [Mass/volume] in Serum or Plasma by Direct assay

6	Create a diagnostic study order	Add the following diagnostic study (Radiology/Imaging) Order: Chest X-ray PA and lateral
7	View and modify a diagnostic study order	View and change the Chest X-ray PA and lateral order to Chest X-ray PA and AP lateral-decubitus
8	View drug-drug interventions prior to order completion	Prescribe Fluoxetine for the patient, then prescribe Phenelzine (These drugs are contraindicated). View the medication interaction, dismiss the alert and continue prescribing the medications.
9	Viewing Drug-allergy interactions	Add a patient allergy to Penicillin and then prescribe Keflex. View the alert message and then dismiss the alert to continue prescribing.
10	Recording active medications	Record Nexium 40mg 1 capsule daily as an active medication in the patient's chart
11	Modify an existing medication record	Review the patient's active medications and change the frequency of Nexium from daily to every six hours
12	Record patient's active medication allergy	Add an allergy to Potassium with a reaction of Nausea
13	View and modify a patient's active medication allergies list	Change the reaction of Potassium from Nausea to Rash
14	Add an Implantable Device to a patient's medical history	Add the UDI code from the provided sample device to the patient record
15	Modify an existing Implantable Device	Add the text "Test Change" to the Notes field for the Cardiac resynchronization device

MA/Nurse tasks

1	View Clinical Decision Support recommendations	View your test patient and review the recommendations provided within the Guideline. Dismiss the alert for the rest of the day.
2	View and acknowledge a lab results guideline	View the clinical lab guideline and close the guidelines screen
3	Create an order for a medication	Prescribe Medication: Omeprazole 20 mg, quantity 30 tablets with 1 refill with the sig "take one by mouth once daily."
4	View and change the medication order	View the medication and modify the order to Omeprazole 40: quantity 30 tablets with 1 refill with the sig "take one by mouth once daily."

5	ePrescribe a medication	Create a new prescription for Simvastatin 10mg tablets, quantity of 30 with refills and a sig of "Take one daily". Then ePrescribe this medication to the patient's preferred pharmacy
6	Cancel an ePrescribed medication	The patient decides he doesn't want to take the Simvastatin that was just prescribed. Cancel the Simvastatin prescription
7	View the fill status of a medication	View the fill status for the patient's Lisinopril 10mg prescription that was prescribed on 7/3/2018
8	Deny a refill request	View and deny a refill request for any patient
9	Create a Lab order	Add the following Laboratory Order: Cholesterol in HDL [Mass/volume] in Serum or Plasma
10	View and modify a Lab order	View the Lab order and change Cholesterol in HDL to Cholesterol in LDL [Mass/volume] in Serum or Plasma by Direct assay
11	Create a diagnostic study order	Add the following diagnostic study (Radiology/Imaging) Order: Chest X-ray PA and lateral
12	View and modify a diagnostic study order	View and change the Chest X-ray PA and lateral order to Chest X-ray PA and AP lateral-decubitus
13	View drug-drug interventions prior to order completion	Prescribe Fluoxetine for the patient, then prescribe Phenelzine (These drugs are contraindicated). View the medication interaction, dismiss the alert and continue prescribing the medications.
14	Viewing Drug-allergy interactions	Add a patient allergy to Penicillin and then prescribe Keflex.View the alert message and then dismiss the alert to continue prescribing.
15	Recording active medications	Record Nexium 40 mg 1 capsule daily as an active medication in the patient's chart
16	Modify an existing medication record	Review the patient's active medications and change the frequency of Nexium from daily to every six hours
17	Import a patient's medication history	Within the patient's chart, view the imported medication history
18	Record patient's active medication allergy	Add an allergy to Potassium with a reaction of Nausea
19	View and modify a patient's active medication allergies list	Change the reaction of Potassium from Nausea to Rash
20	Add an entry to the problem list	Add a problem of "Unspecified asthma" to the patient's medical record
21	View and modify an existing problem list entry	Edit the patient's problem of unspecified asthma by setting the end date to today's date
22	Reconcile data from a CCD	Access the patient's chart and import the medications, allergies, and problems from a CCD into the patient record.

23	Add an Implantable Device to a patient's medical history	Add the UDI code from the provided sample device to the patient record
24	Modify an existing Implantable Device	Add the text "Test Change" to the Notes field for the Cardiac resynchronization device
25	Create a clinical decision support guideline based on a lab result	Log in as an administrator and create a new guideline. Fill in the necessary fields and add a lab results type condition for an abnormal result with a maximum result age of 30 days.
26	View and Modify Demographic Data	Register a new patient with your own first and last name and with a date of birth of today. Set the patient's gender identity to identifies as female, set the sexual orientation to Straight (heterosexual), set the race to European, and set the ethnic group to Unknown. Change the patient's gender identity to Genderqueer (Neither exclusively male nor female), set the sexual orientation to Bisexual, set the preferred language to Spanish, set the race to Navajo, and set the ethnic group to Hispanic or Latino with Latin American as the ethnic detail.

Administrator tasks

1	Adjust a drug/drug interaction level for a user	Change the Drug Interaction levels for Dr. Mihai Fonoage
2	Create a guideline based on: Problem list and Age	Name the guideline your initials followed by the number 1. Add the text "test 1" to the Alert Message field and set the dismissal for 30 days. Add conditions to trigger the guideline based on Age > 30, and a Problem of Acne
3	Create a guideline based on: Medication and Allergy	Name the guideline your initials followed by the number 2. Add the text "test 2" to the Alert Message field and set the dismissal for 1 year. Add conditions to trigger the guideline based on a Medication of Nexium, and an Allergy of Potassium
4	Create a guideline based on: Vital Signs including reference information	Name the guideline your initials followed by the number 3. Add the text "test 3" to the Alert Message field and set the dismissal for 1 year. Add conditions to trigger the guideline based on a BMI ≥ 25. Include the following citation information: "Test Citation" funded and developed by Modernizing Medicine released 11/3/2017

Appendix E System Usability Scale Questionnaire

Participant number: _____ Date: _____

1. I found the tasks were easy to identify and perform based on the amount of

training received.

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 F Usability Test Honorarium Acknowledgement

By signing this document, I acknowledge that I have received an honorarium in the form of a gift card in the amount of $50.00 as a thank you for participating in the EMA Usability Test.

Printed Name: _____

Signature: _____ Date: _____

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