

# Practice Fusion Safety-Enhanced Design Usability Report

*Report based on NISTIR 7742 Customized Common Industry Format Template for Electronic Health  
Record Usability Testing*

Product:	Practice Fusion EHR Version 3.7
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# Executive Summary

Practice Fusion conducted usability testing on select features of the Practice Fusion Electronic Health Record (EHR) web application as part of completing the Safety-Enhanced Design requirements outlined in §170.315(g)(3). The purpose of these studies was to test and validate the usability of the current user interfaces and expected functionality of the EHR in order to elicit insights that would be utilized in the design, development, and maintenance of the EHR system. Fifteen health care professionals matching the target demographic criteria served as participants and used the EHR in simulated, but representative tasks.

We evaluated 17 tasks that were determined based on the required criteria under Safety-Enhanced Design. The following EHR features and processes were tested as part of the tasks of this study:

- Computerized provider order entry (Medications, Labs, Imaging)
- Drug-drug and drug-allergy interaction checks
- Medication list
- Medication Allergy list
- Demographics (Sexual Orientation and Gender Identity)
- Demographics (Race, Ethnicity, Sex, Preferred Language, Preferred Name)
- Clinical Decision Support
- Implantable Devices

During the one and a half hour, one-on-one usability tests, each participant was greeted by the test administrator, briefed on the testing protocols, and instructed that they could withdraw at any time. The test administrator introduced the test and instructed participants to complete the expected tasks. During the testing, the test administrator timed the tasks and recorded user performance data on paper and electronically. The administrator did not assist participants during the test.

Test participants had prior experience with Practice Fusion; no additional training was provided for the purposes of the usability tests, but all participants had the capability to utilize the Practice Fusion training materials available to all EHR users. Practice Fusion makes a variety of training resources available to all EHR end users, including video instruction, customer support, and written training guides.

Meeting §170.315(g)(3) requirements, 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
- Path deviations
- Participant's verbalizations

All participant data was de-identified. Following the study each participant was compensated \$125 for his or her participation. *Table 1 Results Summary* provides a summary of the findings from the study.

Table 1: Results Summary

Tasks	Total # of users	Task success %	Observed Mean task time (seconds)	Optimal Mean task time (seconds)	Observed steps #	Optimal steps #	Ease rating (1-5)	Efficiency rating (1-5)
1. Record Medication	13	100.0%	59	25	11	11	Mean: 4.8 SD: 0.7	Mean: 4.7 SD: 0.6
2. Edit Medication	13	100.0%	37	11	5	5	Mean: 4.8 SD: 0.4	Mean: 4.8 SD: 0.4
3. Create eRx Order	14	92.9%	129	34	19	19	Mean: 4.3 SD: 1.1	Mean: 4.5 SD: 0.8
4. Edit eRx Order	14	92.9%	59	11	11	11	Mean: 4.5 SD: 1.1	Mean: 4.3 SD: 1.2
5. Respond to Drug interactions and allergies	13	100.0%	109	39	11	23	Mean: 4.9 SD: 0.3	Mean: 4.8 SD: 0.4
6. Manage interaction and allergy settings	12	75.0%	118	26	8	8	Mean: 4.4 SD: 0.8	Mean: 4.8 SD: 0.4
7. Create Lab Order	12	100.0%	90	26	11	10	Mean: 4.6 SD: 0.7	Mean: 4.5 SD: 0.7
8. Edit Lab Order	12	100.0%	51	8	3	3	Mean: 4.5 SD: 0.8	Mean: 4.4 SD: 0.8
9. Create Imaging Order	12	100.0%	44	17	5	5	Mean: 4.9 SD: 0.3	Mean: 4.8 SD: 0.4
10. Edit Imaging Order	12	100.0%	44	8	3	3	Mean: 4.9 SD: 0.3	Mean: 4.8 SD: 0.4
11. Add drug allergy	11	100.0%	73	21	11	11	Mean: 4.9 SD: 0.3	Mean: 4.6 SD: 0.5
12. Edit drug allergy	11	90.9%	30	9	6	6	Mean: 4.9 SD: 0.3	Mean: 4.7 SD: 0.5
13. Review CDS Info resource	12	100.0%	62	28	4	4	Mean: 4.3 SD: 1.2	Mean: 4.3 SD: 1.3
14. Manage CDS settings	12	100.0%	74	16	6	6	Mean: 4.8 SD: 0.6	Mean: 4.8 SD: 0.6

15. Record implantable device	13	84.6%	145	78	91	78	Mean: 4.2 SD: 1.4	Mean: 4.2 SD: 1.3
16. Record preferred name and race and ethnicity	10	100.0%	126	48	41	41	Mean: 4.8 SD: 0.4	Mean: 4.6 SD: 0.5
17. Record sexual orientation and gender identity	12	58.3%	103	13	6	5	Mean: 4.0 SD: 1.4	Mean: 4.4 SD: 1.0

## Introduction

The Practice Fusion EHR tested for these studies was Practice Fusion EHR Version 3.7. The Practice Fusion EHR allows clinicians in ambulatory outpatient practices to record and manage patient charts, as well as the ability to order medications, laboratory tests, and radiology tests. It also lets them perform a variety of other clinical and practice-management functions such as maintaining medication lists, recording immunizations, maintaining lists of drug allergies, and scheduling patient appointments.

The purpose of this study was to meet the Safety-Enhanced design requirements for 2015 ONC EHR certification outlined in §170.315(g)(3) and to collect data for our ongoing usability program. Overall, we measured effectiveness, efficiency, ease-of-use and user satisfaction.

## User-Centered Design Process

The Practice Fusion product development process is based on a Design First strategy. Instead of traditional requirements-based development, we leverage a user-centered design process, rapidly iterating to an ideal state which is then used to anchor requirements and development discussions. Practice Fusion utilizes a user-centered design process based on the principles of the ISO 9241-210 and ISO/TR 16982 standards (see Appendix 5), including utilizing many of the cited methods for gathering feedback from our user community and evaluating the usability of our product.

User-centered design is core to the Practice Fusion business. We use a goal-directed methodology for bringing new products and features to market that is broken down into specialized phases:

- **Research** We utilize ethnographic and quantitative research methods to understand our users, their behaviors, and the needs of their practices.
- **Model** Using the results of our research, coupled with proven design patterns and principles, we develop personas and ideal experience scenarios as the cornerstones of our designs.

- **Frame** By building a flexible, robust design framework we can support the existing needs of our customers and accommodate new situations and technological updates in a seamless manner.
- **Refine** Practice Fusion’s design team works closely with our developers and program managers as they scope and prepare for development. As part of this process, we provide the development team with detailed visual designs including all states for each component.
- **Test** Testing occurs throughout the design and development process, as well as after a piece of functionality is released. The testing process also involves actively seeking feedback and guidance from users and subject matter experts to help improve what is built. Practice Fusion instruments all of our interactions so we can monitor and evaluate the performance of our product.
- **Feedback** We are always listening and responding to our users. One mechanism for gathering feedback is through our user forums. As topics are posted, which may represent future product designs or features, in addition to current features, users can “up-vote” the things that they agree with or “vote down” things they think are idiosyncratic or not useful. We evaluate this feedback on a regular basis and it is a core contributor to our feature prioritization strategy.

## Study Design

The objective of this test was to evaluate features related to ONC EHR Certification that were identified as required enhanced design focus specific to patient safety. For each feature we sought to identify areas where the application performed well, areas where it fell short of safety and workflow needs, and our company’s user experience goals. The data from this test will serve as a baseline for future evaluations.

## Participants

A total of 15 healthcare professionals matching the target demographic criteria (below) participated in this usability study (outlined in Table 2). Participants in the test were clinician and practice admin users of Practice Fusion’s EHR system were compensated \$125 for their participation. In addition, test participants had no direct connection to the development of the Practice Fusion EHR and are not connected to any Practice Fusion, Inc. employees or contractors. Test participants had the opportunity to utilize all of the available EHR training materials that are available to all Practice Fusion EHR end users, including video tutorials, customer support, and written guidelines.

## Target Demographic

1. Practice Fusion EHR users for at least three months.
2. In sum, represented a variety of clinical and non-clinical roles, including doctor, nurse practitioner, front desk admin, medical assistant.

3. Have used any of the existing or similar functionality under test:
  - Patient Summary
  - Patient Timeline
  - Patient Profile
  - Encounter notes
  - E-prescribing
4. Have not participated in a focus group or usability test with us in the last 3 months.
5. Does not work in marketing research, usability research, or web design.
6. Does not have a commercial or research interest in an electronic health record software or consulting company.

Table 2. Participant Demographic Data

ID#	Gender	Age	Education	Speciality	Role	Healthcare experience (years)	Healthcare experience (months)	Computer (EHR) experience (months)
ID1	Female	20-29	High School	Pain Medicine	medical assistant	9	108	84
ID2	Female	30-39	Associate degree	Internal Medicine	patient coordinator	3 months	3	3
ID3	Male	40-49	Doctorate degree	Psychiatry	doctor	15	180	120
ID4	Female	50-59	Some college, no degree	Gastroenterology	office manager	22	264	24
ID5	Male	50-59	Doctorate degree	Family Medicine	doctor	31	372	48
ID6	Female	30-39	Doctorate degree	Pediatrics	nurse practitioner	9	108	108

ID7	Female	60-69	Bachelor's degree	Geriatrics, Internal Medicine	office manager	35	420	72
ID8	Female	40-49	Doctorate degree	Primary Care	doctor	18	216	120
ID9	Male	50-59	Doctorate degree	Internal Medicine	doctor	24	288	96
ID10	Female	30-39	Some college, no degree	Thyroid/ Functional Medicine	front desk admin	4	48	18
ID11	Male	40-49	Doctorate degree	Pediatrics	doctor	20	240	96
ID12	Female	40-49	Doctorate degree	Family Medicine	doctor	19	228	228
ID13	Female	30-39	Doctorate degree	Family Medicine	doctor	11	132	6
ID14	Female	30-39	Doctorate degree	Family Medicine	doctor	13	156	96
ID15	Female	50-59	Master's degree	Primary Care, Urgent Care	nurse practitioner	42	504	72

### Usability Metrics

Using the NISTIR 7741 and NISTIR 7742 (see Appendix 5) standard as a guide, the system was evaluated for effectiveness, efficiency, ease-of-use, 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 path deviations
- Number of errors
- Participant's verbalizations (comments)

Table 3. Usability scoring

Measure	Scoring
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<p><b>Effectiveness: Task Success</b></p>	<p>A task was counted as a “success” if the participant was able to achieve the correct outcome without assistance. To calculate the total number of successes we divided number of tasks attempted by the number of participants. The results are reported as a percentage. We recorded task times for successes only.</p> <p>Observed task times divided by the optimal time for each task is a measure of optimal efficiency. Optimal task time as benchmarked by expert performance under realistic conditions, was recorded when constructing tasks. Optimal task times were operationally defined by taking multiple measures of optimal performance and multiplying by a factor of 1.25; this allots buffer time for screenshare delays and to account for participants typically not being trained to expert performance. Thus, if expert optimal performance time on a task was [x] seconds, then optimal task time was determined as [x] * 1.25 seconds. This ratio calculation was applied across all tasks.</p>
<p><b>Effectiveness: Task Failures</b></p>	<p>If the participant abandoned the task, did not reach the correct result, performed it incorrectly, or gave up, we recorded the task as a failure. No task times were recorded for failures in this report.</p>
<p><b>Efficiency: Task Deviations and Errors</b></p>	<p>We recorded the participant’s path (i.e., steps) through the application. Deviations included, for example, navigating to the wrong screen, choosing an incorrect menu item, or interacting incorrectly with an on-screen control. We compared this path to the optimal path.</p> <p>If a participant interacted with the User Interface (UI) in any way that caused them to have to start over on the task, this was captured as an error. A set of path deviations that led to a single failed attempt would be considered a single error. The total number of errors was calculated and then divided by the total number of times that task was attempted to determine the mean error.</p>
<p><b>Efficiency: Task Time</b></p>	<p>We timed each task from the moment the participant finished reading the task instructions aloud until the participant said, “Done.” If the participant failed to say “Done,” we stopped the time when the participant stopped performing the task. Only times for tasks that were successfully completed were included in the average task time analysis. Average time per task was calculated for each task. Standard deviation was also calculated for each task.</p>
<p><b>Satisfaction: Task rating</b></p>	<p>Participant’s subjective perception of the ease of use and efficiency of the system was measured by administering a simple post-task questionnaire and a longer post-session questionnaire. After each task, the participant was asked to rate “Overall, how easy or difficult was it to complete this task?” on a 5-point Likert scale with 1 (Very difficult) to 5 (Very easy), and to rate “How efficient were the steps needed to complete this task?” on a 5-point Likert scale with 1 (Very inefficient) to 5 (Very efficient). These ratings were averaged across participants.</p>

	<p>To measure participants’ confidence, satisfaction, and usability of the full system, the testing team administered an EHR Satisfaction Survey following the session. This post-session questionnaire included ranking questions, such as “The EHR uses familiar terms, symbols, and units,” and “I think I would need the support of a technical person to be able to use this system” and “I am confident that I can use the EHR to perform tasks correctly.” See complete EHR Satisfaction Survey in Appendix 4.</p>
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**Tasks**

We constructed the following representative tasks to exercise the EHR functionality for each feature specified by the ONC. The individual tasks that each participant completed during the usability test are listed in *italics* below each larger EHR feature. For each of the specific usability tests that occurred, the test administrator provided sample test data for each participant to use when completing the tasks as listed, for example, specific medications to enter into the patient chart. For the purposes of this report, that test data has been omitted.

Practice Fusion assessed the risk level for all tasks that were created for each of the required EHR features. These tasks were evaluated based on the potential risk for adverse events to the patient and assigned a risk category of high, moderate, or low risk. For example, tasks that included entering in or modifying data that is used to feed EHR alerts or notifications were determined to be of high risk, while accessing in-product resources or ordering tests that do not contribute to in-product notifications were determined to be low. Tasks that were determined to be of high risk were prioritized in terms of not only evaluation during the usability tests but also in prioritizing product changes related to those tasks. The risk category for each individual task, as well as an overall risk level for the EHR feature, can be found in the Table 4 Patient Safety Risk Category.

Table 4. Patient Safety Risk Category

Task	Patient
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	Safety Risk category
Section 170.315(a)(7): Medication list <ol style="list-style-type: none"> <li>Record a medication</li> <li>Edit a previously recorded medication</li> </ol>	Medium
Section 170.315(a)(1): Computerized provider order entry medications <ol style="list-style-type: none"> <li>Create a prescription order</li> <li>Edit a prescription order</li> </ol>	High
Section 170.315(a)(4): Drug-drug, drug-allergy interaction checks <ol style="list-style-type: none"> <li>Start a prescription order, and respond to (override) the drug-drug interaction and/or drug allergy alert</li> <li>Manage drug interaction and drug allergy settings</li> </ol>	High
Section 170.315(a)(2): Computerized provider order entry-- laboratory <ol style="list-style-type: none"> <li>Start a new draft for a lab order</li> <li>Edit a draft for lab order</li> </ol>	Low
Section 170.315(a)(3): Computerized provider order entry-- diagnostic imaging <ol style="list-style-type: none"> <li>Start a new draft for an imaging order</li> <li>Edit a draft for an imaging order</li> </ol>	Low
Section 170.315(a)(8): Medication allergy <ol style="list-style-type: none"> <li>Record a new drug allergy</li> <li>Edit severity of the allergy</li> </ol>	High
Section 170.314(a)(9): Clinical Decision Support <ol style="list-style-type: none"> <li>Review CDS information</li> <li>Review or Print Diagnostic Therapeutic Information</li> </ol>	Low
Section Section 170.315(a)(5): Demographics (Sexual Orientation and Gender Identity) <ol style="list-style-type: none"> <li>Document sexual orientation and gender identity</li> </ol>	Low
Section 170.315(a)(14): Implantable device list <ol style="list-style-type: none"> <li>Document a patient's Implantable Device</li> </ol>	Low
Section 170.315(a)(5): Demographics (Race, Ethnicity, Sex, Preferred Language, Preferred Name) <ol style="list-style-type: none"> <li>Create a new patient record and document specified information</li> </ol>	Low

## **Procedures**

To prepare for each session, the test administrator oriented the observers who would assist with data logging as needed. In addition, the testing lab was set up to ensure that all data would be captured and the remote access to the test participant was successful, secure, and stable. This included connecting the computer to the shared display so that the administrator and the data loggers could view the action, connecting the shared video and audio that would allow access to viewing and hearing the information from the test participant, and ensuring that the test participant had the correct access information prior to the session. Once the session time began and the test participant joined the session remotely, the test administrator verified the identity of the participant prior to beginning the tasks.

The test administrator moderated the session, including providing instructions to the test participants and reading through the task list prior to beginning the session. The administrator also monitored task times, obtained post-task rating data, and took notes that would assist with evaluating the session at the conclusion of the test. Following the session, the administrator gave each participant the post-test EHR Satisfaction Survey (Appendix 4), and compensated them for their time via an electronic payment system.

## **Test Location**

The usability tests conducted as a part of this study were conducted remotely from a lab at Practice Fusion's headquarters in San Francisco, California using a controlled testing environment with representative but fictitious patient records. The remote tests were conducted using guidelines found at [www.usability.gov](http://www.usability.gov), including utilizing stable and reliable screen share technology and independent and reliable teleconferencing systems. Since Practice Fusion is a completely web-based EHR system, the EHR users who comprised our test participant group were comfortable with accessing the system using their computers and as a result, the remote testing provided an opportunity to observe the tests in a realistic scenario. Additional information on the test environment can be found below.

## **Test Environment**

To ensure a realistic environment, participants were asked to interact with the system using their own computers and the networks they normally use to access the EHR system.

Participants were given access to the remote screen share session and teleconference dial-in information. The test administrator and other assistants were able to view the test participant's computer screen and hear the participant's comments via these mechanisms to ensure that data was captured in real time during the course of the test.

### **Test Forms and Tools**

During the usability test, various documents and instruments were used, including a Moderator's Guide (Appendix 2). The Moderator's Guide was devised so as to be able to capture required data and to follow along with the tasks that each participant was asked to complete during the test. Following each task we asked participants to discuss the ease of use and efficiency, and to explain their rationale, as described in the Moderator's Guide.

### **Participant Instructions**

In order to accurately capture the participant's background, we asked the participant to provide the following demographic and experiential information required for the study prior to scheduling the testing session: specialty, role in their medical practices, years in healthcare, time using the Practice Fusion EHR, and time using electronic health records.

At the beginning of each testing session, the test administrator asked each participant about their expectations during the test, managing them as needed. We also used this time to explain the goals for the session, emphasizing the participant's role, urging them to comment without concern for our feelings. The test administrator also reviewed the agenda for the session with the participant prior to beginning the tasks.

In describing the task scenarios, the test administrator explained that the participant was going to be asked to complete a series of tasks:

- As quickly and efficiently as possible,
- Without help from the administrator, and
- Without discussion, but that the participant could comment as they felt necessary.

The participant was then asked to sign into the EHR testing system and complete each task, while the test administrator recorded their time to completion, errors, and deviations from the optimal path. Any comments that the participant shared during the tasks were also recorded.

# Results

## Data Analysis and Reporting

The results of the usability test were calculated according to the methods specified in the Usability Metrics section above.

There were some participants that did not complete all of the tasks scheduled for the usability test, due to irrelevance and therefore inexperience to their actual role, or due to participant time constraints. As a result, the total number of complete data set would vary module to module.

Table 5. Medication list, Task a.7(1)

Task 1: Record Medication								
Participant ID (total n=13)	Task success	Task path deviation - Observed steps	Task path deviation - Optimal steps	Task time (seconds)	Task time deviation - Mean optimal (seconds)	Errors	Rating: Ease	Rating: Efficiency
ID1	1	11	11	49	25	1	5	5
ID2	1	11	11	53	25	0	5	5
ID3	1	11	11	46	25	0	5	5
ID4	1	11	11	52	25	0	5	4
ID5	1	11	11	104	25	0	5	5
ID6	1	11	11	82	25	0	5	5
ID7	1	11	11	73	25	0	5	5
ID8	1	11	11	33	25	1	4	5
ID9	1	11	11	72	25	0	5	5
ID10	1	11	11	28	25	0	5	5
ID11	1	11	11	43	25	0	5	5
ID12	1	11	11	44	25	0	5	4
ID13	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID15	1	12	11	92	25	0	3	3
<b>TOTAL</b>	13					2		
<b>MEAN</b>	100.0%	11		59		15%	4.8	4.7
<b>SD</b>	0.00	0.3		23		0.4	0.6	0.6

### Comments:

- I like that you have the frequent medications list.
- It would be nice to customize my medications quick list.
- I rarely use start dates [for previously prescribed] because the patients never know. We will add an arbitrary one like January 1 with the right year.
- It's fine, I don't see an easier way to do this.
- I don't use start/stop date that often for prescriptions that are not mine.

Table 6. Medication List, Task a.7(2)

Task 2: Edit Medication								
Participant ID (total n=13)	Task success	Task path deviation - Observed steps	Task path deviation - Optimal steps	Task time (seconds)	Task time deviation - Mean optimal (seconds)	Errors	Rating: Ease	Rating: Efficiency
ID1	1	5	5	100	11	0	5	4
ID2	1	6	5	65	11	1	4	5
ID3	1	5	5	30	11	0	5	5
ID4	1	5	5	16	11	0	5	5
ID5	1	6	5	27	11	0	5	5
ID6	1	5	5	31	11	0	5	5
ID7	1	6	5	29	11	1	5	5
ID8	1	5	5	25	11	0	5	5
ID9	1	5	5	14	11	0	5	5
ID10	1	5	5	30	11	0	5	5
ID11	1	5	5	26	11	0	5	5
ID12	1	5	5	61	11	0	5	4
ID13	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID15	1	5	5	23	11	0	4	4
<b>TOTAL</b>	13					2		
<b>MEAN</b>	100.0%	5		37		15%	4.8	4.8
<b>SD</b>	0.00	0.4		24		0.4	0.4	0.4

**Comments:**

- It would be better if I could add a year and not enter the actual date. I don't want to put in a date that isn't exactly accurate.
- Typically I don't add start date at all.
- Could be better if there was a table on the Summary and I could change any information right away.

Table 7. Computerized provider order entry, medication, Task a.1(i)

Task 1: Record eRx Order								
Participant ID (total n=14)	Task success	Task path deviation - Observed steps	Task path deviation - Optimal steps	Task time (seconds)	Task time deviation - Mean optimal (seconds)	Errors	Rating: Ease	Rating: Efficiency
ID1	1	19	19	150	34	0	5	5
ID2	1	20	19	260	34	1	4	5
ID3	1	19	19	63	34	0	4	4
ID4	0	N/A	19	N/A	34	1	1	5
ID5	1	19	19	150	34	0	4	4
ID6	1	19	19	190	34	0	5	5
ID7	1	19	19	90	34	0	5	5
ID8	1	19	19	64	34	0	5	5
ID9	1	19	19	101	34	0	5	5
ID10	1	20	19	198	34	0	5	5
ID11	1	19	19	62	34	0	5	3
ID12	1	19	19	133	34	0	4	3
ID13	1	19	19	98	34	0	5	5
ID14	N/A	N/A	19	N/A	N/A	N/A	N/A	N/A
ID15	1	19	19	120	34	0	3	4
TOTAL	13					2		
MEAN	100.0%	19		129		14%	4.3	4.5
SD	0.27	0.4		60		0.4	1.1	0.8

Comments:

- I always add the associated Dx to the prescription. Then I print it for the patient so that they can give accurate information to other providers; also good to have on record for my own use.
- I have never used eRx before so it was difficult at first but once I learned it, it was very easy.
- I like that this can be done from the patient's chart.
- It would be nice to have my own list of common medications.

Table 8. Computerized provider order entry, medication, Task a.1(2)

Task 2: Edit eRx Order								
Participant ID (total n=14)	Task success	Task path deviation - Observed steps	Task path deviation - Optimal steps	Task time (seconds)	Task time deviation - Mean optimal (seconds)	Errors	Rating: Ease	Rating: Efficiency
ID1	1	15	11	154	17	1	4	5
ID2	0	N/A	11	N/A	17	2	1	1
ID3	1	11	11	30	17	0	4	4
ID4	1	11	11	65	17	0	5	5
ID5	1	11	11	81	17	0	5	5
ID6	1	11	11	46	17	0	5	4
ID7	1	11	11	96	17	0	5	5
ID8	1	11	11	30	17	0	5	5
ID9	1	11	11	42	17	0	5	5
ID10	1	11	11	39	17	0	5	5
ID11	1	11	11	34	17	0	5	3
ID12	1	11	11	58	17	0	4	3
ID13	1	11	11	40	17	0	5	5
ID14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID15	1	11	11	47	17	0	5	5
<b>TOTAL</b>	13					3		
<b>MEAN</b>	100.0%	11		59		21%	4.5	4.3
<b>SD</b>	0.27	1.1		35		0.6	1.1	1.2

**Comments:**

- This happens often. Sometimes I have to change the amount on the prescription and I've already send it out. What I do is put in the notes that the old prescription was never actually given to the patient with my initials, and then I write VOID on the printed script and scan it into document it.
- Nothing I can think to improve this flow. A slight improvement would be to pre-populate with the most common SIGs and have to change it only if I want to do something different. You could have us program settings to turn the most common SIG on or off.
- This was the first time I had done that. It wasn't as hard as I thought it would be.

Table 9. Drug-drug, drug-allergy interaction checks, Task a.4(1)

Task 1: Respond to Drug interactions and allergies								
Participant ID (total n=13)	Task success	Task path deviation - Observed steps	Task path deviation - Optimal steps	Task time (seconds)	Task time deviation - Mean optimal (seconds)	Errors	Rating: Ease	Rating: Efficiency
ID1	1	23	23	96	39	0	5	5
ID2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID3	1	23	23	78	39	0	5	5
ID4	1	23	23	124	39	0	5	5
ID5	1	23	23	171	39	0	5	5
ID6	1	23	23	114	39	0	5	5
ID7	1	23	23	83	39	0	5	5
ID8	1	24	23	114	39	0	5	5
ID9	1	23	23	68	39	0	5	5
ID10	1	23	23	94	39	0	5	5
ID11	1	24	23	80	39	0	5	5
ID12	1	23	23	111	39	0	5	4
ID13	1	23	23	96	39	0	5	4
ID14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID15	1	23	23	190	39	0	4	4
<b>TOTAL</b>	13					0		
<b>MEAN</b>	100.0%	23		109		0%	4.9	4.8
<b>SD</b>	0.00	0.4		36		0.0	0.3	0.4

Comments:

- I want to add more notes on why it was overridden for malpractice protection.
- Sometimes I miss alerts because they don't stand out enough.
- It would save me time if I could add a new diagnosis from this spot. Right now I comment that patient has severe heart disease for example so the supervising physician can see it.

Table 10. Drug-drug, drug-allergy interaction checks, Task a.4(2)

Task 2: Manage interaction and allergy settings								
Participant ID (total n=12)	Task success	Task path deviation - Observed steps	Task path deviation - Optimal steps	Task time (seconds)	Task time deviation - Mean optimal (seconds)	Errors	Rating: Ease	Rating: Efficiency
ID1	0	N/A	8	N/A	26	1	3	4
ID2	0	N/A	8	N/A	26	1	5	5
ID3	1	8	8	60	26	0	5	5
ID4	1	8	8	64	26	0	4	5
ID5	1	8	8	325	26	2	5	5
ID6	1	8	8	144	26	0	3	5
ID7	0	N/A	8	N/A	26	2	4	5
ID8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID9	1	9	8	120	26	0	5	5
ID10	1	8	8	46	26	0	5	5
ID11	1	9	8	45	26	0	5	5
ID12	1	8	8	121	26	0	4	4
ID13	1	8	8	137	26	1	5	5
ID14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<b>TOTAL</b>	9					7		
<b>MEAN</b>	75.0%	8		118		58%	4.4	4.8
<b>SD</b>	0.45	0.4		87		0.8	0.8	0.4

**Comments:**

- The task itself is very easy but not efficient because it was hard to find when you don't know where to go.
- I initially thought the setting would be under 'e-prescribing'.
- I would never turn off drug alerts for legal security. If a patient dies, I could be asked why I turned off an alert in a court of law.
- I haven't done this in awhile, but I remember it being fairly easy.

Table II. Computerized provider order entry, labs, Task a.2(1)

Task 1: Create Lab Order								
Participant ID (total n=13)	Task success	Task path deviation - Observed steps	Task path deviation - Optimal steps	Task time (seconds)	Task time deviation - Mean optimal (seconds)	Errors	Rating: Ease	Rating: Efficiency
ID1	1	10	10	42	26	1	4	4
ID2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID3	1	10	10	48	26	0	5	5
ID4	1	11	10	58	26	1	4	4
ID5	1	13	10	208	26	1	4	4
ID6	1	10	10	136	26	0	5	5
ID7	1	10	10	82	26	0	5	5
ID8	1	12	10	115	26	1	1	2
ID9	1	10	10	132	26	0	2	2
ID10	1	11	10	54	26	1	5	4
ID11	1	10	10	49	26	0	5	5
ID12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID13	1	11	10	77	26	1	5	5
ID14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID15	1	10	10	74	26	0	5	5
<b>TOTAL</b>	12					6		
<b>MEAN</b>	92.3%	11		90		46%	4.2	4.2
<b>SD</b>	0.00	1.0		50		0.5	1.3	1.1

**Comments:**

- This was less efficient since I had to leave the Summary, but it also worked well and made sense in Actions. I guess I can't think of a better place to put it.
- I don't order labs electronically at all.
- My preconceived thinking was that I would be able to find it under the Facesheet (Summary).
- I would never do this. On a piece of paper I just select or circle A1C. This seems like more of an expense.
- You kind of need to know where to look. It's not clear that I would need to go to Actions, but it makes sense.
- It's great that an MA can do this.

Table 12. Computerized provider order entry, labs, Task a.2(2)

Task 2: Edit Lab Order								
Participant ID (total n=12)	Task success	Task path deviation - Observed steps	Task path deviation - Optimal steps	Task time (seconds)	Task time deviation - Mean optimal (seconds)	Errors	Rating: Ease	Rating: Efficiency
ID1	1	3	3	61	8	1	5	5
ID2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID3	1	4	3	46	8	0	3	3
ID4	1	4	3	85	8	1	4	4
ID5	1	4	3	148	8	0	3	3
ID6	1	3	3	69	8	0	5	5
ID7	1	3	3	55	8	0	5	5
ID8	1	3	3	60	8	0	N/A	N/A
ID9	1	4	3	31	8	0	4	4
ID10	1	3	3	18	8	0	5	5
ID11	1	3	3	14	8	0	5	5
ID12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID13	1	3	3	15	8	0	5	5
ID14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID15	1	3	3	10	8	0	5	4
<b>TOTAL</b>	12					2		
<b>MEAN</b>	100.0%	3		51		17%	4.5	4.4
<b>SD</b>	0.00	0.5		39		0.4	0.8	0.8

**Comments:**

- I like that you can type and search for a diagnosis name when you may not know the code.
- Oh, I had no idea there was an option to review Dx history from the lab.
- I would not want to search for all Dx's. It would be more efficient if I didn't have to go to another tab to find the Dx.
- The options for associated diagnosis should show in a drop-down like they do for prescriptions.

Table 13. Computerized provider order entry, imaging, Task a.3(1)

Task 1: Create Imaging Order								
Participant ID (total n=12)	Task success	Task path deviation - Observed steps	Task path deviation - Optimal steps	Task time (seconds)	Task time deviation - Mean optimal (seconds)	Errors	Rating: Ease	Rating: Efficiency
ID1	1	5	5	118	17	0	4	4
ID2	1	5	5	108	17	0	5	5
ID3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID4	1	5	5	87	17	0	4	4
ID5	1	5	5	46	17	0	5	5
ID6	1	5	5	189	17	0	4	4
ID7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID9	1	5	5	65	17	0	3	3
ID10	1	5	5	53	17	0	5	5
ID11	1	5	5	28	17	0	5	5
ID12	1	5	5	74	17	0	5	4
ID13	1	5	5	30	17	0	5	5
ID14	1	5	5	61	17	0	5	5
ID15	1	5	5	46	17	0	5	5
TOTAL	12					0		
MEAN	100.0%	5		75		0%	4.6	4.5
SD	0.00	0.0		45		0.0	0.7	0.7

**Comments:**

- This was a very easy task for the doctor since he learned how to order labs in the previous scenario.

- It is the same as lab ordering.

Table 14. Computerized provider order entry, imaging, Task a.3(2)

Task 2: Edit Imaging Order								
Participant ID (total n=12)	Task success	Task path deviation - Observed steps	Task path deviation - Optimal steps	Task time (seconds)	Task time deviation - Mean optimal (seconds)	Errors	Rating: Ease	Rating: Efficiency
ID1	1	3	3	44	8	0	5	5
ID2	1	3	3	30	8	0	5	5
ID3	N/A	N/A	3	N/A	N/A	N/A	N/A	N/A
ID4	1	4	3	110	8	0	4	4
ID5	1	3	3	92	8	0	5	5
ID6	1	3	3	70	8	0	5	5
ID7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID9	1	3	3	8	8	0	5	5
ID10	1	3	3	3	8	0	5	5
ID11	1	3	3	12	8	0	5	4
ID12	1	3	3	16	8	0	5	5
ID13	1	3	3	17	8	0	5	5
ID14	1	3	3	119	8	0	5	5
ID15	1	3	3	6	8	0	5	5
<b>TOTAL</b>	12					0		
<b>MEAN</b>	100.0%	3		44		0%	4.9	4.8
<b>SD</b>	0.00	0.3		43		0.0	0.3	0.4

**Comments:**

- Pretty straight forward.
- That was actually pretty easy.

Table 15. Medication allergy list, Task a.8(1)

Task 1: Add drug allergy								
Participant ID (total n=11)	Task success	Task path deviation - Observed steps	Task path deviation - Optimal steps	Task time (seconds)	Task time deviation - Mean optimal (seconds)	Errors	Rating: Ease	Rating: Efficiency
ID1	1	11	11	62	21	0	5	4
ID2	1	11	11	70	21	0	5	5
ID3	1	11	11	41	21	0	4	4
ID4	1	12	11	84	21	1	5	5
ID5	1	12	11	95	21	1	5	5
ID6	1	11	11	65	21	0	5	5
ID7	1	11	11	53	21	0	5	5
ID8	1	11	11	86	21	0	5	4
ID9	1	11	11	53	21	0	5	5
ID10	1	12	11	164	21	1	5	5
ID11	1	11	11	28	21	0	5	4
ID12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID13	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<b>TOTAL</b>	11					3		
<b>MEAN</b>	100.0%	11		73		27%	4.9	4.6
<b>SD</b>	0.00	0.5		36		0.5	0.3	0.5

**Comments:**

- There should be a longer list of predefined reactions or I should be able to add something on my own.
- There isn't a way to put in something isn't official, like an agitation. I want to note it because the patient will want to see it there even if it's not a true allergy.

Table 16. Medication allergy list, Task a.8(2)

Task 2: Edit drug allergy								
Participant ID (total n=11)	Task success	Task path deviation - Observed steps	Task path deviation - Optimal steps	Task time (seconds)	Task time deviation - Mean optimal (seconds)	Errors	Rating: Ease	Rating: Efficiency
ID1	0	N/A	6	N/A	9	1	5	4
ID2	1	7	6	50	9	1	4	5
ID3	1	6	6	21	9	0	5	5
ID4	1	6	6	29	9	0	5	5
ID5	1	6	6	38	9	0	5	5
ID6	1	6	6	23	9	0	5	5
ID7	1	6	6	20	9	0	5	5
ID8	1	7	6	38	9	0	5	4
ID9	1	6	6	36	9	0	5	5
ID10	1	6	6	23	9	0	5	5
ID11	1	6	6	23	9	0	5	4
ID12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID13	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<b>TOTAL</b>	10					2		
<b>MEAN</b>	90.9%	6		30		18%	4.9	4.7
<b>SD</b>	0.30	0.4		10		0.4	0.3	0.5

**Comments:**

- I didn't know I could add more than one reaction at a time.

Table 17. Clinical Decision Support, Task a.9(i)

Task 1: Review CDS Info resource								
Participant ID (total n=12)	Task success	Task path deviation - Observed steps	Task path deviation - Optimal steps	Task time (seconds)	Task time deviation - Mean optimal (seconds)	Errors	Rating: Ease	Rating: Efficiency
ID1	1	4	4	53	27.5	0	5	5
ID2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID3	1	4	4	56	27.5	0	5	5
ID4	1	4	4	60	27.5	0	5	5
ID5	1	4	4	91	27.5	0	5	5
ID6	1	4	4	49	27.5	0	5	5
ID7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID9	1	4	4	49	27.5	0	4	4
ID10	1	4	4	41	27.5	0	5	5
ID11	1	4	4	43	27.5	0	4	5
ID12	1	4	4	99	27.5	0	3	3
ID13	1	4	4	96	27.5	0	4	3
ID14	1	4	4	43	27.5	0	5	5
ID15	1	4	4	58	27.5	0	1	1
<b>TOTAL</b>	<b>12</b>					<b>0</b>		
<b>MEAN</b>	<b>100.0%</b>	<b>4</b>		<b>62</b>		<b>0%</b>	<b>4.3</b>	<b>4.3</b>
<b>SD</b>	<b>0.00</b>	<b>0.0</b>		<b>21</b>		<b>0.0</b>	<b>1.2</b>	<b>1.3</b>

Comments:

- I've been wanting to do that for 3 years! (print reference information for patient)
- This information is not helpful to me. Why can't I use .phrases to pull up the patient information for the patient? In [other EHR] I was able to do this in free text in my Assessment.
- Information about foot care would be more meaningful. This is too generic for this banner.

Table 18. Clinical Decision Support, Task a.9(2)

Task 2: Manage CDS settings								
Participant ID (total n=12)	Task success	Task path deviation - Observed steps	Task path deviation - Optimal steps	Task time (seconds)	Task time deviation - Mean optimal (seconds)	Errors	Rating: Ease	Rating: Efficiency
ID1	1	7	6	47	16	1	5	5
ID2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID3	1	6	6	35	16	0	5	5
ID4	1	6	6	83	16	0	5	5
ID5	1	7	6	137	16	1	5	5
ID6	1	6	6	111	16	0	5	5
ID7	1	6	6	46	16	0	5	5
ID8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID9	1	6	6	69	16	0	5	5
ID10	1	7	6	62	16	1	5	5
ID11	1	6	6	57	16	0	5	5
ID12	1	6	6	116	16	0	3	3
ID13	1	6	6	80	16	0	5	5
ID14	1	6	6	44	16	0	5	5
ID15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL	12					3		
MEAN	100.0%	6		74		25%	4.8	4.8
SD	0.00	0.5		32		0.5	0.6	0.6

Comments:

- I also considered Practice Details or Message Settings to make the changes.
- There's a lot in here. But I do want to leave the one for rare diseases on, I would use that.

Table 19. Demographics (Sexual Orientation/ Gender), Task a.5(i)

Task 1: Record Sexual Orientation and Gender Identity								
Participant ID (total n=12)	Task success	Task path deviation - Observed steps	Task path deviation - Optimal steps	Task time (seconds)	Task time deviation - Mean optimal (seconds)	Errors	Rating: Ease	Rating: Efficiency
ID1	0	N/A	5	84	13	2	3	4
ID2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID3	0	7	5	N/A	13	2	2	2
ID4	0	6	5	N/A	13	1	1	5
ID5	1	5	5	134	13	0	5	5
ID6	1	5	5	182	13	0	5	5
ID7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID9	1	5	5	97	13	0	5	5
ID10	1	5	5	127	13	0	5	5
ID11	0	7	5	N/A	13	2	3	3
ID12	0	6	5	N/A	13	1	4	4
ID13	1	6	5	47	13	1	5	5
ID14	1	5	5	109	13	0	5	5
ID15	1	5	5	42	13	0	5	5
<b>TOTAL</b>	<b>7</b>					<b>9</b>		
<b>MEAN</b>	<b>58.3%</b>	<b>6</b>		<b>103</b>		<b>75%</b>	<b>4.0</b>	<b>4.4</b>
<b>SD</b>	<b>5.0</b>	<b>0.8</b>		<b>46</b>		<b>0.9</b>	<b>1.4</b>	<b>1.0</b>

**Comments:**

- First place I would think is Past Medical History.
- Why doesn't smoking status get listed here too? Why don't we add marital status?
- I would also like to note relationship and religious background here.
- As a feature request, I would like to save languages like frequent medications/most common languages for practice; the feature as it is is too tedious to search through.
- To me gender identity & orientation aren't like smoking that will change; summary is medical information, profile is about the person.
- To me, it makes sense since it's not information I'd add in when a patient calls for an appointment, which is mostly Profile related. Considering this I feel that Race and Ethnicity should be with gender/sexual orientation.

- I normally have bad experiences being forced to click on boxes that are not really relevant for the patient. And having it tell me none is recorded bothers me. It would be great to be able to remove areas I don't want to use on the Summary.
- The 'Not recorded' still shows even though I selected a button already. Moving this section to the second or third column in Summary would save me so much time, because I wouldn't need to see it every time.
- This is great. It would be nice to add marital status and religion or spiritual notes.
- It makes sense that it's in social history. Maybe it should be in the Profile too, both.

Table 20. Implantable Devices, Task a.14(1)

Task 1: Record implantable device								
Participant ID (total n=13)	Task success	Task path deviation - Observed steps	Task path deviation - Optimal steps	Task time (seconds)	Task time deviation - Mean optimal (seconds)	Errors	Rating: Ease	Rating: Efficiency
ID1	0	82	78	253	78	1	5	4
ID2	0	81	78	N/A	78	1	5	5
ID3	1	78	78	159	78	1	4	4
ID4	1	78	78	121	78	0	5	5
ID5	1	78	78	240	78	0	5	4
ID6	1	78	78	118	78	0	5	5
ID7	1	86	78	87	78	1	5	5
ID8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID9	1	78	78	88	78	0	4	4
ID10	1	78	78	44	78	0	5	5
ID11	1	78	78	259	78	0	1	1
ID12	1	78	78	104	78	0	2	3
ID13	1	78	78	113	78	0	5	5
ID14	1	210	78	280	78	1	N/A	N/A
ID15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<b>TOTAL</b>	<b>11</b>					<b>4</b>		
<b>MEAN</b>	<b>78.6%</b>	<b>90</b>		<b>145</b>		<b>29%</b>	<b>4.2</b>	<b>4.2</b>
<b>SD</b>	<b>0.29</b>	<b>37.9</b>		<b>75</b>		<b>0.5</b>	<b>1.4</b>	<b>1.3</b>

**Comments:**

- I prefer to copy/paste to avoid typos; after typing the long number he'll re-read every digit carefully.
- That's really so cool.
- I wish this information could be sent to him electronically.
- It is nice to get the description of the device.
- It is not highlighting 'save'. Oh, I probably need to hit 'verify'.
- Wow, I didn't know there was a global database, that's a cool feature.

- Am I going to have to enter the long code? If it's by hand and I can't copy and paste, it would be very inefficient. We would try to use it, but that would be incredibly inefficient.
- Oh, implantable devices is new. I like that.
- Very easy, except for the length of that code.

Table 21. Demographics (Race, Ethnicity, Sex, Preferred Language, Preferred Name), Task a.5(2)

Task 1: Record Race, Ethnicity, Sex, Preferred Language, Preferred Name								
Participant ID (total n=10)	Task success	Task path deviation - Observed steps	Task path deviation - Optimal steps	Task time (seconds)	Task time deviation - Mean optimal (seconds)	Errors	Rating: Ease	Rating: Efficiency
ID1	1	41	41	74	48	0	5	5
ID2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID3	1	41	41	95	48	0	5	4
ID4	1	41	41	107	48	0	5	5
ID5	1	42	41	182	48	1	5	5
ID6	1	41	41	103	48	0	5	5
ID7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ID10	1	41	41	112	48	0	5	5
ID11	1	41	41	135	48	0	4	4
ID12	1	41	41	136	48	0	5	4
ID13	1	42	41	150	48	0	4	4
ID14	1	41	41	161	48	0	5	5
ID15	N/A	N/A	41	N/A	48	N/A	N/A	N/A
<b>TOTAL</b>	10					1		
<b>MEAN</b>	100.0%	41		126		10%	4.8	4.6
<b>SD</b>	0.00	0.4		33		0.3	0.4	0.5

**Comments:**

- I like to scroll tab through demographic fields.
- Profile is spaced out so it's not very efficient when I have to look for specific spots I want to fill out.
- All those languages are a bit of an overload.

## Major Test Findings

### Effectiveness

This study tested 10 modules across 17 tasks. We saw that over 90% of our participants were able to complete 14 of those tasks quickly and without assistance. The three tasks that had a lower percentage for success were regarding documenting implantable devices, with 71.4% success rate, recording sexual orientation and gender identity with 58.3% success rate, and managing interaction and allergy alerts at 75% success rate. Both the Implantable Devices feature and the Demographics (Sexual orientation and Gender identity) features were new features that the participants had never seen in the Practice Fusion EHR, nor had documented in any other form, including on paper. When probed, they told us they had trouble locating where this information could be recorded because there could be a few relevant areas in the chart, e.g. the Patient Profile and the Patient Summary. With drug-drug interaction and allergy alert settings, most participants, whether they completed this task successfully or not, reported having seen this setting at one point in time, but have not wanted or needed to turn off any alerts. Note that, given all interaction and allergy alerts are default enabled, any errors in the associated task do not introduce the potential for patient harm.

### Efficiency

Efficiency was measured by recording individual times on task and averaging across successful attempts, as well as with self-reported participant ratings for efficiency (5-point scale). Of the seventeen tasks, seven were completed on average under a minute, with three tasks on average, requiring over two minutes to complete. The longer times recorded were for tasks involving new features, Implantable Device and Demographics, and Prescription ordering. Of important note, participants rated efficiency on average to be “Efficient” across all tasks. On average, all tasks were rated above 4, on a scale with 5 as “Very efficient” and 1 as “Very inefficient.”

### Ease-of-use

The participants in this study ranked these tasks, on average, as “Easy” to complete. Across all tasks, the average rating was above 4, on a 5-point scale, with 5 as “Very easy” and 1 as “Very difficult.”

### Satisfaction

We evaluated user satisfaction with a EHR Satisfaction survey evolved from the standardized System Usability Scale (SUS), to more meaningfully reflect Practice Fusion’s user experience standards and goals. In this survey, participants were asked to rate their agreement with 11 statements, and then had the option to provide narrative descriptions of how the EHR works well for them, and how it could be improved. The free-text responses will be used to inform future product improvements and considerations.

In the rating questions, respondents rated the EHR with high satisfaction. Percentages below were calculated to include responses for ‘Agree’ and ‘Strongly agree.’

- 100% of respondents said they would like to use this EHR frequently
- 83% of respondents said they did not find the system unnecessarily complex
- 100% of respondents said the EHR is easy to learn and use
- 92% of respondents said they would not need the support of a technical person to use the EHR
- 100% of respondents said the EHR uses familiar terms, symbols, and units
- 91% of respondents said the EHR makes important information stand out
- 92% of respondents said the EHR workflows match their expectations
- 100% of respondents said the EHR makes it easy to detect and correct mistakes
- 82% of respondents said they imagine it would not be difficult for most people to use the system
- 100% of respondents said they were confident they could use the EHR to perform tasks correctly
- 100% of respondents said they would recommend the system to a friend or colleague

### Areas for Improvement

Our highest priority in conducting this testing was to evaluate these features with patient safety in mind. In that respect, we found no errors that would impact patient safety. The majority of the usability feedback reflected data-entry workflows that could be made more efficient for our users. The User Research team took note of these design optimizations and shared them with the product development and design teams as appropriate. We plan to conduct additional testing and feedback sessions on the following error-prone steps to fully understand and optimize for our users:

- Location and placement of sexual orientation and gender identity in the Social History section
- Expansion of allergy reactions drop-down options, or free-text documentation of other allergy reactions on Summary
- Free-text documentation of implantable devices when no Unique Device Identifier is available
- Streamline workflow when user transitions from recording a medication to prescribing a medication
- Additional training or educational material on workflow tips and shortcuts:
  - Existing Diagnoses for this patient shown in the Labs/Imaging Orders toolbox
  - Location of Sexual orientation and Gender identity fields

## Appendix 1: Recruiting Screener

For recruiting participants, we sent out our standard survey screener, then conducted a second round of outreach based on our recruiting criteria.

Interested in giving feedback and reviewing designs for future features?

Our User Research team is looking for EHR users who are interested in giving feedback on new designs and to talk to us about how your office works. Participation involves a phone interview with a screenshare.

In this survey, tell us which topics you're interested in and how to reach you.

Next

Survey questions:

1. What is your role?
2. What areas of the EHR do you use regularly?
3. How long have you been using EHRs (including Practice Fusion)?
4. In a typical week, what is your availability to participate?
5. How should we contact you?

Second round of outreach:

Thanks for your interest in user research studies! The first one we have coming up is a paid usability study. We will be having volunteers perform their normal tasks (including entering medications in the Meds list, creating lab orders, etc.) and timing the task to know how long it takes on average to complete it.

For this study, we will be going through up to 12 tasks (depending on what your normal workflow looks like) on a test EHR account I will provide, so we will be reserving 1 hour and 15 minutes—though it may take you less time. Because it is such a big time commitment, we are offering a \$125 Amazon gift card for your participation. Of course, we will schedule this at a date/time you choose.

Any interest? Happy to discuss over the phone or email if you have any questions.

If you are interested, you can reserve a block of time this month here: <https://calendly.com/pfresearch/usability-testing>

# Appendix 2: Moderator’s Guide and Participant Instructions

## Introduction & Participant background

To kick off the session with the participant:

- Thank the participant for their interest
- Ask the participant to provide a brief intro of their sex, age, education level, specialty, role, time using PF, time using an EHR, technology needs, etc.
- Document their demographics in the table below
- Explain our goals for the session, emphasizing the participant’s role
- Urge them to think aloud as they progress, commenting about their expectations and questions

## Task-based Scenarios

Explain that we are going to ask the participant to complete a series of tasks:

- As quickly and efficiently as they can
- Without help from us, noting that we are testing the product, not them
- The user should tell us when they are done, or if they are stuck and feel they can’t move forward

## Agenda

1. Read the description of the case to them.
  - a. Below the case, we’ve listed the tasks they need to complete and the data they will use to complete the tasks.
2. Have the user read ‘User Instructions’ aloud before beginning a task.
  - a. Timing begins when the user finishes reading ‘User Instructions’ aloud.
3. Document their use of the system on the table following each task.
  - a. Circle PASS after task completion or FAIL if the participant was not successful.
  - b. Document the number of attempts used for each task.
4. After completion or task forfeiture, ask the participant to rate task ease of use and task efficiency on a scale of 1-5 (1 being a low score, 5 being a high score).
5. Ask the participant to complete the post test questionnaire.

**Scenario 1: Medications, Task 1**

User Instructions: Add the following medication to the patient's chart.

Lisinopril 10 MG Oral Tablet

Patient: Eric Test

Medication Start Date: 3/6/17

User actions:

Deviations from expected workflow:

Errors:

Verbalizations:

Time:

Pass/ Fail:

**Scenario 1: Medications, Task 2**

User Instruction: Change the start date for Lisinopril from 3/6/17 to 4/12/17. Do not add additional information to the medication, just save it.

Patient: Eric Test

Medication: Lisinopril 10 MG Oral Tablet

Start Date: 4/12/17

User actions:

Deviations from expected workflow:

Errors:

Verbalizations:

Time:

Pass/ Fail:

**Scenario 2: Prescriptions, Task 1**

User Instructions: Document an order for the following medication. Enter the SIG in your own format. Then print the prescription.

Patient: Mary Test

Medication: Lorazepam 2 MG Oral Tablet

Start Date: Today

Stop Date: None

SIG: 1 tablet (1 mg) by mouth 2 times per day

Dispense: 30 tablets

Refill: 1

User actions:  
Deviations from expected workflow:  
Errors:  
Verbalizations:  
Time:  
Pass/ Fail:

**Scenario 2: Prescriptions, Task 2**

User Instructions: Update the prescription for the same medication, but this time dispense 60 tablets.  
Patient: Mary Test  
Medication: Lorazepam 2 MG Oral Tablet  
Start Date: Today  
Stop Date: None  
SIG: 1 tablet (1 mg) by mouth 2 times per day  
Dispense: 60 tablets  
Refill: 1

User actions:  
Deviations from expected workflow:  
Errors:  
Verbalizations:  
Time:  
Pass/ Fail:

**Scenario 3: Drug-drug interactions and allergies, Task 1**

User Instructions: Prescribe the following medication. Override the alert because the drug may be lifesaving for the patient.  
Patient: Larry Test  
Medication: Simvastatin 20 mg tablet  
Start Date: Today  
Stop Date: None  
SIG: By mouth once daily  
Dispense: 30  
Refill: 1  
Override reason: Drug may be lifesaving for the patient.

User actions:  
Deviations from expected workflow:  
Errors:

Verbalizations:  
Time:  
Pass/ Fail:

**Scenario 3: Drug-drug interactions and allergies, Task 2**

User Instructions: Your username is Test Participant. Set up your alerts to only show up for Severe drug interactions and Severe allergy reactions for your username.

User actions:  
Deviations from expected workflow:  
Errors:  
Verbalizations:  
Time:  
Pass/ Fail:

**Scenario 4: Lab orders, Task 1**

User Instructions: Start a lab order for Monica's A1C test with the information in the table. Do not enter any additional order details; just save it. You'll finish the order in the next task.

Patient: Monica Test

Lab: Practice Fusion Testing Lab

Lab test: 1014 - Hemoglobin A1c/hemoglobin.total in blood

User actions:  
Deviations from expected workflow:  
Errors:  
Verbalizations:  
Time:  
Pass/ Fail:

**Scenario 4: Lab orders, Task 2**

User Instructions: In the same lab order, check to see that Diabetes is already in the patient's diagnoses list. Associate Diabetes as the diagnosis to the order.

Patient: Monica Test

Lab: Practice Fusion Testing Lab

Lab test: 1014 - Hemoglobin A1c/hemoglobin.total in blood

User actions:  
Deviations from expected workflow:  
Errors:  
Verbalizations:  
Time:

Pass/ Fail:

**Scenario 5: Imaging orders, Task 1**

User Instructions: Start an imaging order for the patient below. Do not enter any additional order details; just save it. You'll finish the order in the next task.

Patient: Michael Test

Imaging Center: Other

Imaging Order: Multisection Xray of Spine

User actions:

Deviations from expected workflow:

Errors:

Verbalizations:

Time:

Pass/ Fail:

**Scenario 5: Imaging orders, Task 2**

User Instructions: For the same patient, check that 'Concussion, sequela' has been added to his Diagnoses List. Then add 'Concussion, sequela' as a diagnosis for this imaging order.

Patient: Michael Test

Imaging Center: Other

Imaging Order: Multisection Xray of Spine

Diagnosis: Concussion, sequela

User actions:

Deviations from expected workflow:

Errors:

Verbalizations:

Time:

Pass/ Fail:

**Scenario 6: Medication allergies, Task 1**

User Instructions: Add the patient's allergy to Sulfa drugs to his record.

Patient: John Test

Drug allergy: Sulfa drugs

Allergy severity: Moderate

Reaction: Skin rash- generalized

User actions:

Deviations from expected workflow:

Errors:

Verbalizations:

Time:

Pass/ Fail:

**Scenario 6: Medication allergies, Task 2**

User Instructions: For the same patient, open the drug allergy and update its severity.

Patient: John Test

Drug allergy: Sulfa drugs

Allergy severity: Severe

Reaction: Skin rash, difficulty breathing

User actions:

Deviations from expected workflow:

Errors:

Verbalizations:

Time:

Pass/ Fail:

**Scenario 7: Clinical Decision Support, Task 1**

User Instructions: Open an encounter for this patient. In the ‘Diabetic Foot Exam’ notification, find and print the diagnostic therapeutic information so you can provide it to your patient.

Patient: Kyle Test

Diagnosis: Diabetes

User actions:

Deviations from expected workflow:

Errors:

Verbalizations:

Time:

Pass/ Fail:

**Scenario 7: Clinical Decision Support, Task 2**

User Instructions: Turn off clinical support reminders for Rare Diseases for all providers in this practice.

User actions:

Deviations from expected workflow:

Errors:

Verbalizations:

Time:

Pass/ Fail:

**Scenario 8: Sexual orientation & gender identity, Task 1**

User Instructions: For this patient, enter the following information in her chart.

Patient: Frank Test

Sexual Orientation: Homosexual

Gender Identity: Male

User actions:

Deviations from expected workflow:

Errors:

Verbalizations:

Time:

Pass/ Fail:

**Scenario 9: Implantable devices, Task 1**

User Instructions: Document the patient's implantable device with the following details.

Patient: Frank Test

Implant date: 6/5/2017

Device Identifier:

+B06600032501NS1/\$S420020216LOT123456789012345/SXYZ456789012345678/16D20130202C1

User actions:

Deviations from expected workflow:

Errors:

Verbalizations:

Time:

Pass/ Fail:

**Scenario 10: Patient Demographics, Task 1**

User Instructions: Add a new patient into the EHR with the following demographic information. Any additional information is optional.

Patient: Maryanne Test

Preferred name: Mary

Sex: Female

Date of Birth: June 6th, 1988

Race/Ethnicity: Asian and Irish

Preferred Language: English

User actions:

Deviations from expected workflow:

Errors:

Verbalizations:

Time:

Pass/ Fail:

## Appendix 3: Test Participant Compensation Redeemed

The screenshot below indicates confirmation that test participants have redeemed the compensation they were given for participating in the Practice Fusion Usability Test. The receipts below are aggregated totals that represent compensation amounts given to multiple participants. Similar redemption receipts were received for all test participants (each given \$125).

Redeemed



Amazon eGift Card - Smile

Amount  
\$750.00

Status  
Redeemed

Archive order

Redeemed



Amazon eGift Card - Smile

Amount  
\$750.00

Status  
Redeemed

Archive order

# Appendix 4: EHR Satisfaction Survey

## EHR Satisfaction Survey (SED)

**1. I think that I would like to use this EHR frequently.**

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
<input type="radio"/>				

**2. I found the system unnecessarily complex.**

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
<input type="radio"/>				

**3. The EHR is easy to learn and use.**

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
<input type="radio"/>				

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

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
<input type="radio"/>				

**5. The EHR uses familiar terms, symbols, and units.**

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
<input type="radio"/>				

**6. The EHR makes important information stand out.**

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
<input type="radio"/>				

**7. The EHR workflows match my expectations.**

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
<input type="radio"/>				

**8. The EHR makes it easy to detect and correct mistakes.**

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
<input type="radio"/>				

**9. I would imagine that it would be difficult for most people to use this system.**

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
<input type="radio"/>				

**10. I am confident that I can use the EHR to perform tasks correctly.**

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
<input type="radio"/>				

**11. I would recommend the system to a friend or colleague.**

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
<input type="radio"/>				

**12. What does the system do well?**

**13. What could be improved?**

## Appendix 5: Industry Standards referenced

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