⌂ ▤   **ONC Change Package for Improving EHR Usability**   🛈 🖶

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ONC Change Package for Improving EHR Usability

The Office of the National Coordinator for
Health Information Technology ℠

▶ **Quick Start Guide**

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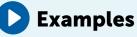| Introduction and Examples | Preparing for Change | Problem Finding | Locating a Tool | Implementing a Solution | Additional Resources |

Quick Start Guide: Take a Dive into EHR Usability

Just getting started with EHR usability?

▶ Introduction

Review the purpose and structure of this resource, and get some basic usability information.

▶ Examples

Review a list of common usability challenges and see how you are doing.

Comfortable with basic EHR usability?

▶ Preparing for Change

Learn about EHR usability from basic design to information support, and understand the types of usability challenges and the role of training and customization.

▶ Problem Finding

Review the basics of identifying usability challenges and understanding the impact of interdisciplinary team communication, and look over some case studies.

Experienced with EHR usability and looking for resources?

▶ Implementing a Solution

Understand the critical considerations you should be aware of when planning an implementation, and become familiar with possible unintended consequences.

▶ Locating a Tool

» Brief overviews for each usability resource
» One-page descriptions with the estimated level of effort required to use the resource
» List of strengths and weaknesses
  - most accessible, easy-to-use tools at the beginning
  - more complicated resources near the end

▶ Additional Resources

» Additional references
» Resources that may contain background information
» Advanced usability resources
» Resources beyond the scope of the primary goal of this document

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Introduction

The Office of the National Coordinator for Health Information Technology

If You Are Having Trouble Identifying Where to Begin

The ▐ **EHR Usability Problem Examples** and the scenarios in the ▐ **Problem Finding** section may help you identify similar issues in your system and then point you to specific tools that may help with those issues.

▐ **Examples**

▶ Quick Start Guide

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A Guide to Using the Change Package

This change package can be used in a number of ways, depending on your familiarity with EHR **usability**. If you are new to health care usability or would like a refresher on important concepts and examples, you may benefit from reading the ▐ **Preparing for Change** section of the document. It presents an overview of electronic health record **(EHR)** usability, change management, the importance of interdisciplinary teams, potential unintended consequences, and example scenarios. This information will help prepare you to use the resources in the next section, ▐ **Problem Finding**. Or, if you are familiar with EHR usability, you can go directly to the ▐ **Problem Finding** section.

▐ **Problem Finding** provides a brief overview of each usability resource. The one-page descriptions include assessments of the strengths and weaknesses of each resource, and the estimated level of effort required to use the resource. Within this section, easy-to-use tools are near the front of the list, and more advanced resources are near the end. In the ▐ **Additional Resources** section, you will find materials containing background information, more advanced content, or related materials.

Purpose

The purpose of this document is to describe a toolkit that a health care organization can use to expand the utility, usability, and safety of their EHR and other health information technology **(health IT)** systems. The document provides a conceptual overview of EHR usability, tools to optimize health IT usability and usefulness, scenarios illustrating how this toolkit may be helpful, and descriptions with links to pertinent resources that will assist with **optimization**. The resources in this document are intended to serve individuals responsible for EHR changes in both large hospital systems and small practices.

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Introduction

The Office of the National Coordinator for Health Information Technology

Background

The rapid adoption of **EHRs** and **health IT** systems has made it easier for health care professionals to get access to and store large amounts of patient data, to read medical orders and records, and to more quickly communicate with each other.[1, 10, 15]

However, the complex and diverse nature of health care settings can make it hard to design and implement a good IT system.[2, 6, 13] Some systems don't provide the right support for frontline health care professionals, which can result in limited **workflow** processes and stress for clinicians.[3, 17] The IT software should help clinicians to achieve desired goals in an efficient, effective, and satisfactory manner. If this doesn't happen, it may become a **usability** issue.[9, 11, 18]

Health IT usability reflects the work of designers and developers, **implementation** decisions made by the provider organization, preferences set by the user, and the context of the task being performed. Many vendors offer guidance and consulting services to help you get the most out of an EHR or other health IT product. And some federal and state agencies, health care organizations, nonprofits, and other organizations have developed free, publicly available resources that can help. We discuss some of these specific tools in the 🔖 **Locating a Tool** section of this document.

Luckily, health care settings are not the only places that deal with IT usability issues, nor are they the first. We can learn from many other high-risk fields—such as the military, aviation, and automotive industries—that have established ways to develop, implement, and optimize complex IT systems, as we discuss later.

EHR Usability Problem Examples

Examples of EHR Usability Issues *(See also: Basic Usability Resources)*

This page provides examples of **EHR** usability issues to show the range of problems that may affect **usability**. Not every EHR will contain these examples—**they are shown for illustration only**. Other usability challenges are found in the ▌ **Locating a Tool** and ▌ **Additional Resources** sections.

Usability—Basic Design Principles	Usability—Information Support Issues
Nurses are worried about patient safety because the abnormal results on lab tests aren't clearly visible (they are the same font style and color as normal results). *See Case Study* ▌ **Patient Harm Event**	Since a new update to their EHR rolled out, users are having trouble locating lab results as they did in the past. *See Case Study* ▌ **EHR Updates**
YES — Are abnormal and critical results easy to identify and read (e.g., no yellow text on a white background)?	**YES** — Do the common search terms and language used in the clinical setting allow users to get to the correct result?
Users have noted that they can't always record the complete medication list details on patients. *See Case Study* ▌ **Help Desk Ticket**	When staff first began using their new EHR, they noticed that the way they were generating reports had changed. *See Case Study* ▌ **Implementing a New EHR**
YES — If a nurse records non-adherence with an antihypertensive, is that reliably reflected in the medication reconciliation when the physician admits the patient?	**YES** — Is the team able to run reports on critical information?
Clinicians are noticing that their free text fields for clinical notes are too small for them to make complete remarks. *See Case Study* ▌ **Vendor Support**	Prescription drug monitoring program data on controlled substances is not available during the initial patient encounter and the prescription writing period. *See Case Study* ▌ **Process Improvement**
YES — Are notes made by physicians during the ordering process clearly visible when transmitted to nurses, pharmacists, technicians, and others?	**YES** — Is information displayed in a meaningful way at the most appropriate time?

Preparing for Change: Learn about Usability

Introduction to Preparing for Change

Human factors engineering is an accepted way to address **usability** problems. In this approach, we take into consideration the abilities and limitations of humans when we design tools, machines, systems, tasks, jobs, and environments for safe, comfortable, and effective human use.[5]

To apply this concept to the health care setting, think about a clinician who must use an **EHR** every day as a critical part of their job. Human factors engineering can help us address questions like:

- Can the doctor easily find and place orders for medications, lab results, tests, and other things they need?

- Is it easy for the doctor to complete a patient visit and document it in the EHR in a way that meets regulatory requirements?

- During the patient visit, can the doctor stay focused on the patient while meeting key documentation requirements?

Visit the following pages in this section to learn more about usability:

- ▶ EHR Usability Primer
- ▶ Background Information
- ▶ Basic Design and Information Support
- ▶ Problem Types
- ▶ Training and Customization

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Preparing for Change: Learn about Usability

EHR Usability Primer

Informally, the term **usability** describes how an organization's **health IT** software functions in comparison to the needs of health care team members and the way they perform their work.[16] The pain points, challenges, and frustrations expressed by frontline users of health IT are frequently examples of limited usability. In many cases, usability problems are initially identified as patient safety concerns, provider and staff burden issues, interoperability challenges, insufficient training, and/or other concerns. This Change Package will focus on identifying and addressing core usability challenges.

Limited usability can make it hard for clinician users to navigate a health IT system, find the information they need, or use a system's more advanced features. A health IT system that is limited in design or **implementation** might have an inconsistent user interface, lack the ability to perform important functions, or result in more work for the user.

For example, a limited **EHR** design may require users to re-document a patient's smoking status on every visit to the office or hospital, even after it has been noted that the patient has never smoked in their life (reporting requirements notwithstanding). Or the EHR may not be able to generate basic reports, forcing staff to spend more time and effort to generate these reports manually.

When considered in isolation, individual pain points or usability issues like these may seem small, but they add up. Over the course of a day, physicians, nurses,[15, 17] and clinical and practice staff spend a lot of time attending to the EHR, resulting in less time spent in the direct care of patients.[4]

Usability is formally defined as the extent to which a system supports a user to efficiently and effectively achieve desired goals, and is part of the scientific discipline of **human factors**. Usability can be measured quantitatively by examining error rates and time-on-task, and it can be assessed qualitatively by observing and talking with users. There are specific, proven, and trusted ways to get a better understanding of user needs and to apply this knowledge to develop better systems, resulting in safer practices.

Preparing for Change: Learn about Usability

Background Information

Usability goes beyond common-sense design decisions. Early-stage testing during development, evidence-based **implementation**, and post-deployment surveillance and observations can identify and mitigate many usability issues, preventing harm to the patient and reducing staff inefficiencies. Common **EHR** usability challenges are listed in the table[17] below, based on work done by the National Institute of Standards and Technology (NIST).

Use Errors	Possible Harm Observed
User ordered procedure for the wrong patient	Intended patient does not receive treatment, resulting in a range of possible harms ranging from suboptimal disease management to death Incorrect patient receives unnecessary procedure, resulting in possible harms ranging from temporary and/or mild discomfort to permanent injury or death
User ordered wrong test	Delay in diagnosis or suboptimal disease management due to additional time required to recognize wrong test order and re-order correct test False positive diagnosis based on test results of wrong test, leading to unnecessary treatment
User stopped a medication to which a patient had an allergic reaction but did not add medication to the patient's allergy list	Patient is re-prescribed a medication to which patient has a known allergy, resulting in a deadly allergic reaction
User scheduled appointment for wrong patient	Delay in follow-up care for intended patient, resulting in suboptimal disease management
User ordered an unnecessary medication	Patient receives unnecessary medication, resulting in anything from mild discomfort to deadly allergic reaction
User documented that an influenza vaccine had been administered without actually ordering (or administering) the vaccine	Patient does not receive influenza vaccination and contracts a form of influenza, resulting in a life-threatening pulmonary infection
User overlooked clinical reminder and failed to order a diagnostic screening test (e.g., a mammogram)	Patient does not receive the diagnostic test, resulting in delayed detection of a critical diagnosis (e.g., breast cancer), and thereby appreciably worsening prognosis

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Preparing for Change: Learn about Usability

Basic Design and Information Support

When your organization sets out to optimize your **health IT** system, you likely have one or both of the following goals:

- To improve the **basic interface** of information, or

- To provide **information support** to your health care team members as they vary across specialty and the organization.[8, 19]

The basic principles concerning how information is displayed are referred to as **heuristics**. Many heuristic principles are used in high-risk industries like aviation, as well as other industries that require clear and easy-to-use interfaces to prevent errors, like consumer electronics.[14]

To see how heuristic principles are applied to health IT systems, consider these two simple examples:

- If you want to ensure that users can easily read information on the screen, you'll want to avoid using yellow text on a white background.

- If you want to help users when they enter incorrect information or push the wrong key, you'll want to provide a back/recovery button.

Aside from improving the display of information, the second goal of **optimization** is to make sure that users get the information they need so that they can do job-specific tasks well. For example, think about the information that a pediatrician needs and what an OB/GYN needs. The pediatrician needs easy access to height/growth charts for every patient on every office visit, so that they can identify diseases early. The OB/GYN, meanwhile, needs to closely monitor different patient variables during office visits, like prenatal labs, which have a dramatic impact on the delivery of a baby.

Beyond these specialty-specific examples, there are **workflow**- and process-based needs that may vary by state, health care system, hospital, unit, or even at the individual level. You'll also want to take these into consideration when designing your organization's **health IT** system. If you don't, it can lead to staff inefficiency, or, worse yet, errors or delays in health care for patients.

You can find advanced **usability 🔖 testing resources** in the 🔖 **Additional Resources** section of this document.

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Preparing for Change: Learn about Usability

Problem Types

As in a lot of areas of life, we often wait until something goes wrong to consider what to improve. In the health care setting, this means that improvements to **health IT** systems are often delayed until a patient is harmed or a significant **near-miss** happens.

Ideally, your health IT system should be well-designed and implemented in a safe and efficient manner from the start, to lessen the chance that errors will occur—this is called primary prevention. But you also need a process that will allow you to identify and remove hidden hazards as they happen, to prevent impacts on the patient—this is called secondary prevention.

In this document, you'll learn how to optimize your health IT system and meet the two goals of improving basic interface/information display and individual information needs. We suggest combining a primary proactive risk approach and a secondary hazard identification approach, as you can see in the figure below.

Problem Types

	Basic Design Issues	Information Support Issues
Proactive Risk Primary Prevention	I	II
Hazard Identification Secondary Prevention	III	IV

Preparing for Change: Learn about Usability

Training and Customization

It's important to make an **EHR** as usable as possible. But it's equally important to properly train users to get the most of the EHR. Because software systems can be very complex, even the most experienced medical professionals should receive training.

Although your practice or health care system may want to customize your EHR to meet your unique needs, **customizations** may conflict with best practices recommended by the vendor and **health IT** experts.

There should be a balance between how much you customize your EHR and how much you allow the interface to remain standardized across a specific product. Customization can provide critical features or improve interoperability between different health IT systems. On the other hand, **standardization** can reduce the chances of users encountering challenges when switching between health care organizations, reduce unintended consequences of upgrading software, and allow vendors to promote best practices.

Your organization and your vendor should make an informed decision about whether to customize or standardize. The goal should be to standardize whenever possible, and account for the possible effects on your organization down the road. Ultimately, these decisions should make the right things easy to do and the wrong things harder to do.

Problem Finding: Case Studies to Review

Introduction to Problem Finding

It's likely that your health care organization has already identified some issues through process improvement projects, help desk tickets, and patient safety reports. But these issues might not initially be identified as problems associated with **usability**. It is not always obvious to frontline health care providers whether a given problem is related to usability.

The following scenarios with descriptions, examples, and related tools are meant to help your health care organization identify specific opportunities for **optimization**.

Communication Focused

▶ Vendor Support

▶ Matching a Tool to a Problem

▶ Interdisciplinary Team Communication

Problem Focused

▶ EHR Updates

▶ Help Desk Ticket

▶ Implementing a New EHR

▶ Patient Harm Event

▶ Process Improvement

Problem Finding: Case Studies to Review

Communication Focused

Vendor Support *(See also: SAFER Guides)*

This scenario takes place between an Ambulatory Care Clinic Director of Operations and the Attending Surgeon at a clinic where the physicians have privileges at five hospitals. They currently use an **EHR**, but are experiencing challenges tracking surgical orders and referrals for their patients, resulting in a delay in follow-up.

Start
(click the arrow icon to advance to the next step)

Step 1
Prepare for the Change

Step 1

Did you find out why it's been taking too long for us to contact and schedule patients for surgery?

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Problem Finding: Case Studies to Review
Communication Focused

Matching a Tool to a Problem *(See also: Optimization Strategies for CDS)*

A midsize hospital's experienced clinical informatics team is planning to implement a radiology clinical decision support (CDS) system in their emergency department but need to build the CDS into their **EHR** and track changes to their providers' **workflows**.

Start
(click the arrow icon to advance to the next step)

**Step 1
Prepare for the Change**

Step 1

We've received notice that the hospital isn't in compliance with the recent radiology CDS mandate. How can we address this?

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Problem Finding: Case Studies to Review
Communication Focused

Interdisciplinary Team Communication

Interdisciplinary Team Communication and Finding an Optimization Opportunity

This section emphasizes communication with different types of interdisciplinary teams once an area needing improvement in the **EHR** has been identified, and presents potential opportunities for health care organizations to identify them.

The interdisciplinary nature of EHRs makes it critical that diverse stakeholders communicate effectively across teams that may include the EHR vendor, informatics professionals within the organization, administrative officials, clinical experts, and frontline staff. Each member of a team will have a specific viewpoint, skill set, and experiences that must be taken into consideration once a **usability** issue is identified to avoid delays in implementing an effective improvement.

Your Vendor as a Resource

Vendors may have technical resources or lessons learned from previous **implementations** of their software that could help identify and address an organization's usability challenges. Contacting the vendor directly is often the most effective way for you to identify the types of additional resources your vendor has. Examples of these resources include online user groups, conferences, or direct communication with vendor staff who are knowledgeable of the system in question. Using screenshots and video recordings of specific use errors can significantly aid in communicating the problem(s). EHR vendors have variable access to clinical users and are unable to test for and monitor every potential usability issue, and therefore can benefit from direct feedback.

A health care organization or provider can initiate contact with their vendor with an outline of current challenges. Including identified potential solutions can assist in the development of more effective and sustainable solutions for the both the health care organization and the EHR vendor. (See link to a Health Information and Technology, Evaluation, and Quality [HITEQ] Center guide below for facilitating communication.)

[Microsoft Health Common User Interface Design Guidance](#)

[HITEQ Center: Accessing Your Data: Questions to Consider with Your Electronic EHR Vendor](#)

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Problem Finding: Case Studies to Review
Communication Focused

Interdisciplinary Team Communication *(continued)*

Other vendor resources include:

- **EHR Vendor Solutions and Packages:** Your **EHR** vendor may offer **implementation** packages or clinical content tailored for your care setting and/or specialty. Examples of specialized EHR vendor content available include (but are not limited to) the following areas and/or settings: pediatric, federally qualified health centers, behavioral health, ambulatory surgery centers, care management, and academic (resident- and student-enabled **workflows**).

- **EHR User Groups:** Most vendors support sponsored or facilitated user communities where their customers can gather (both in-person and virtually) to share best practices and experiences in using and optimizing their EHR. EHR user groups can serve as a critical community to quickly identify solutions or innovative approaches to common challenges or create community-level support for advocating for new functionality from the vendor.

- **Professional Organizations:** You may also find resources via professional societies such as American College of Physicians, American College of Emergency Physicians, National Association of Community Health Centers, and Association of Medical Directors of Information Systems. These organizations can also serve in an advocacy capacity when interfacing with your vendor.

- **Vendor Responsiveness:** If your vendor is not responsive to your request for support, consider contacting your EHR's ONC-Authorized Certification Body and/or ONC (see provider complaint process).

Organization's Informatics Professionals and Administrative Officials

In addition to clear communication between the EHR vendor and a health care organization, it is critical that the informatics team within the health care organization has clear lines of communication with the frontline clinical staff and the vendor. Often it is the informatics team that assesses and triages a request to optimize the **usability** of the EHR or request a new feature. Without good interdisciplinary team communication, it is challenging to appropriately prioritize those usability issues that are most impacting the clinical user experience. The HITEQ Center short guide and list of consultants mentioned above and linked on the previous page may also be useful in facilitating this channel of communication.

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Problem Finding: Case Studies to Review
Communication Focused

Interdisciplinary Team Communication *(continued)*

Clinical Experts and Frontline Staff

Clinical experts and frontline staff are key to improving the **usability** of the **EHR**. It is the work, as performed by the clinical users of the system, that ultimately demonstrates the quality and functionality of the system. Thus, the user experience drives the accuracy of the information placed into the EHR. Ideal communication between clinical staff, the informatics/administrative team, and the EHR vendor will facilitate prioritization of the most impactful usability challenges while assisting with short-term solutions for usability issues that cannot be immediately addressed.

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Problem Finding: Case Studies to Review
Problem Focused

EHR Updates

Description

Updates to the **EHR** should occur on a regular basis to improve existing systems or add new features. EHR updates may impact site-specific **customization**, which means that it's critical to test the usability of all components that may be impacted by an update.

Example

Issue: The patient tracking board is a key component of caring for patients in the emergency department (ED). In one particular ED, the tracking board was customized to better represent the geographic layout of individual teams.

During an update to the EHR, the filtering and sorting of patients on the tracking board was reset back to the EHR vendor default setup, and the customizations were removed. The change removed users' ability to have a default sort order and grouping that allowed them to monitor all patients in the ED.

After discussing the usability issue with informatics staff, it was clear that the change in the interface was a known issue with the update, but the issue had not been communicated to the frontline staff.

Action: After the update, clinical staff were immediately trained on the new **workflow** that was similar to the previous ordering of patients on the tracking board. The informatics team then worked with clinical staff to determine the best set of default filters and the best sort order so that future updates would have limited impact on clinical care.

Also, the hospital informatics team worked with the vendor to expand the list of default settings and allow users to have personalized settings that would not be impacted on future updates.

Toolkit Items

- SAFER Guides
- Electronic Health Record Evaluation Tool
- Guide to Reducing Unintended Consequences of Electronic Health Records
- HIMSS Physician Community Pain Points Webinar

ONC Change Package for Improving EHR Usability

Introduction and Examples	Preparing for Change	Problem Finding	Locating a Tool	Implementing a Solution	Additional Resources

Problem Finding: Case Studies to Review
Problem Focused

Help Desk Ticket

Description

An **EHR** should always be tested before it goes live. But the test environment can't simulate the rigorous conditions that nurses and physicians work under while providing clinical care to patients. The issues that frontline staff identify through the course of normal work can be a rich source of information regarding how the EHR is used, how it performs, and what challenges users encounter in the real world.

The information services staff who field requests for help are in a unique position to see and report the repetitive nature of **usability** issues that occur. The availability of screen capture technology or screen sharing adds the potential to fully understand the context of the errors and the user experience. The help desk personnel can then play a key role in communicating these issues in aggregate with their EHR vendor to assist in validating, prioritizing, and resolving the issues.

Toolkit Items

▶ SAFER Guides

▶ Guide to Reducing Unintended Consequences of Electronic Health Records

Example

Issue: A large health care system upgraded its EHR to include electronic provider documentation and created a new **workflow**. Before go-live, all users attended 4 hours of hands-on training in a test environment, and no one reported any issues.

But during the rollout, many users called the help desk complaining that patient data were missing, and they had to resort to old methods and work-arounds to access previous records, EKGs, and radiology reports. The users were reminded about the default date filter on the side of the interface that could be adjusted if no records were present.

Action: The informatics team recognized that the users needed a brief refresher on the interface and sent out training guides to all users of the EHR during the rollout. They then adjusted the default filter to show a longer period of time to ensure that patient records were visible.

In addition, they worked with the EHR vendor to adjust the location and status display of the filter to make it clear to users that more records were present and accessible, but were not being displayed.

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Problem Finding: Case Studies to Review
Problem Focused

Implementing a New EHR

Toolkit Items

▶ Monitoring Health IT and EHR Goal Achievement

▶ SAFER Guides

Description

Implementing a new **EHR** requires understanding user and organization needs, planning for **implementation**, selecting an EHR that meets the organization's needs, conducting training and pilot testing, implementing the EHR, and continuing with quality improvement projects.

An organization often must strike a balance between the **customization** that it desires and the software **standardization** that an EHR vendor recommends to provide a consistent and usable experience. Because the software is complex, custom changes to the interface or system may have unintended consequences that significantly impact the **usability** of other parts of the system.

Example

Issue: During the design and implementation process of a new commercial EHR, a health care organization recognizes that their previous EHR relied on specific, highly customized forms for data entry in the ambulatory setting. These old forms had been developed slowly over many years. They allowed experienced users to input data quickly and provided basic clinical decision support and the ability to track population health statistics.

Despite receiving training on the new system, many users had a hard time adjusting to the lack of forms and the different structure. This initially led to decreased efficiency and many documentation errors.

Action: Managers at each location identified certain staff members who were highly proficient in using the old EHR. These high performers provided structured notes on the default settings they used, and the vendor worked to make sure that these were incorporated into the new EHR, so that each user did not have to recreate their own defaults.

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Problem Finding: Case Studies to Review

Problem Focused

Patient Harm Event

Description

Users don't often think about or report on how **EHR usability** affects patient safety events. It's hard to recreate the state of the EHR during the event and to understand its specific role in such an event. But after each event, it's key to review the EHR and audit trails, and to speak with users. This can provide a better understanding of the event and can offer insight into how an organization can make systematic changes that will help to prevent events from happening in the future.

Toolkit Items

▶ SAFER Guides

▶ Guide to Reducing Unintended Consequences of Electronic Health Records

▶ HIMSS Physician Community Pain Points Webinar

Example

Issue: While discharging a patient from the hospital, a physician performed a medication reconciliation to write up the patient's discharge medications. The patient typically took Dilantin ER (Extended Release) 300mg once a day for seizures, but had been placed on Dilantin (Immediate Release) 100mg three times a day while in the hospital. During the ordering process, the patient was accidentally prescribed Dilantin ER (Extended Release) 300mg three times a day. The error was subsequently identified, and due to the potential severity of the triple overdose, a patient safety event was recorded. A review of the audit logs and medication process showed that the EHR medication reconciliation screen likely contributed to the error, but it was not possible to determine what the physician saw, and the error could not be reproduced.

Action: Management worked with the informatics team to place safety margins on specific drugs, so that the EHR users could not easily order doses outside of acceptable margins. In addition, the informatics team and EHR vendor made it possible to record each step of the reconciliation process, and to have running screen captures of EHR interactions. This helped to store and preserve the information so that it could be reviewed later for both safety and operational purposes.

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Problem Finding: Case Studies to Review
Problem Focused

Process Improvement

Description

Process improvement involves identifying and examining the systematic issues within an organization or elements within an **EHR**. The goal of process improvement is to optimize system-wide **usability**, usefulness, safety, or efficiency. Process improvement efforts usually involve a small- to medium-sized multi-stakeholder team that works to limit any unanticipated consequences of making a change.

> ### Toolkit Items
>
> ▶ SAFER Guides
>
> ▶ Electronic Health Record Evaluation Tool
>
> ▶ Guide to Reducing Unintended Consequences of Electronic Health Records
>
> ▶ Usability Maturity Model Assessment Plan and Checklist

Example

Issue: A small suburban primary care practice of five physicians noticed that radiology reports for several patients had been entered into the EHR, but had not been reviewed by the physician. Luckily, all the reports showed negative results. But these **near-misses**—hazardous situations or events that did not initially cause patient harm, but may in the future—could have resulted in harmful or even life-threatening delays in care.

On further review of other random charts, the practice noticed that the issue was not simply the result of a single staff member entering the reports incorrectly or a specific physician missing the results in the system. An evaluation team watched the **workflow** of the medical assistants entering the reports and interviewing. They found that there was no standardized way to attach the reports to the patient's electronic record, and that staff did not always use the notification system.

Action: For the short term, the practice created a protocol and checklist to help remind the clerical staff how to assign reports for review by the physician, and to remind them of the importance of preventing missed reports. They then created a process in the EHR to look for unreviewed results in the system. They also created a rubber stamp for the assistants to document which physician the report was assigned to for review.

As a more sustainable solution, the practice worked with their EHR vendor to create a default that asks the assistant to assign the record to a physician, and asks the assistant to make it clear what information is new in the chart, so that it is easily identifiable whenever a user opens the chart.

ONC Change Package for Improving EHR Usability

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Locating a Tool

Introduction to Locating a Tool

This Tools and Resources Directory provides a brief overview for each **usability** resource. The one-page descriptions also include an assessment of the strengths and weaknesses of each resource, the phase of impact when the resource is most useful, and the estimated level of effort required to use the resource. Within this section, the most accessible, easy-to-use tools are listed near the front of the list, and the more complicated resources are near the end.

- SAFER Guides–Clinical Processes
- Usability Maturity Model Assessment Plan and Checklist
- Electronic Health Record Evaluation Tool
- Monitoring Health IT and EHR Goal Achievement
- Guide to Reducing Unintended Consequences of EHRs

- HIMSS Physician Community EHR Usability Pain Point Survey Webinar
- Optimization Strategies for Clinical Decision Support (CDS)
- Planning for EHR Transition
- Health Information Technology Evaluation Toolkit
- Health IT-enabled Quality Improvement (eCQI) Worksheet

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Locating a Tool

SAFER Guides—Clinical Processes

Phase of Impact			Estimated Effort		
Design and Implementation	Hazard Analysis	Harm Reduction	Low	Moderate	High

Description

The SAFER Guides are designed to help health care organizations conduct self-assessments to optimize the safety and safe use of **EHRs** in several areas. Based on the best evidence available at the time of creation (2013), the SAFER Guides contain content developed from a literature review, expert opinion, and field testing at a wide range of health care organizations from small ambulatory practices to large health systems. The recommended practices in the SAFER Guides are intended to be useful for all EHR users. **A user of a SAFER guide will walk through the self-assessment checklist of recommended practices and indicate whether their organization has implemented that practice.** Each recommended practice has a work-sheet with examples of practices or scenarios to support its **implementation**. The checklist also allows the user to enter assessment notes and actions for follow-up, and to identify the person responsible for follow-up action.

Tools

Three SAFER guides are focused on clinical processes and can be used based on the needs of your practice:

- Patient Identification
- Computerized Provider Order Entry with Decision Support
- Test Results Reporting and Follow-Up
- Clinician Communication

Strengths

- Interactive worksheet allows users to organize and quickly print self-assessment
- Mostly actionable, specific recommended practices with examples
- Checklist format helpful for primary prevention or pre-implementation

Areas for Improvement

- Exhaustive completion of the self-assessment requires engagement from the vendor, providers, and clinician leadership
- Some recommended practices do not offer clear steps for the organization to take

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Locating a Tool

Usability Maturity Model Assessment Plan and Checklist

Phase of Impact			Estimated Effort		
Design and Implementation	Hazard Analysis	Harm Reduction	Low	Moderate	High

Description

The Usability Maturity Model Assessment Tool: Action Plans and Checklist is an Excel document from the Healthcare Information and Management Systems Society (HIMSS), a group dedicated to improving health care through **health IT**. **The checklist is intended to focus the user on understanding and improving their organization's usability maturity level.** The phases of usability maturity are: Unrecognized, Preliminary, Implemented, Integrated, and Strategic.

Each tab in the Excel document represents a phase of usability maturity, and provides three to seven actions an organization can take to build on their current phase of usability maturity and improve to the next level.

Tools 🌐

- [The HIMSS Usability Maturity Model Assessment Tool: Action Plans & Checklist](#)

Strengths

- Actionable
- Identifies next steps at each phase of maturity
- Allows for documentation of efforts

Areas for Improvement

- High-level actions; focused on organizational usability maturity, not product usability maturity

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Locating a Tool

Electronic Health Record Evaluation Tool

Phase of Impact			Estimated Effort		
Design and Implementation	Hazard Analysis	Harm Reduction	Low	Moderate	High

Description

The Electronic Health Record Evaluation Tool is a quality improvement tool developed by the Agency for Healthcare Research and Quality. **The tool is meant to be used by a health organization to evaluate the extent to which their EHR can report on that organization's testing processes.**

The tool is a brief six-question survey that asks specific questions about the data reporting capabilities of an EHR related to laboratory or imaging tests. This tool could be used by organizations that want to identify gaps in their EHR's reporting capabilities.

> ### Tools
> - [The Electronic Health Record Evaluation Tool](#)

Strengths

- Simple-to-use evaluation tool that helps users figure out if their EHR can help them with quality and safety measures

Areas for Improvement

- Not focused on **usability** or evaluation of EHR itself

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Locating a Tool

Monitoring Health IT and EHR Goal Achievement

Phase of Impact			Estimated Effort		
Design and Implementation	Hazard Analysis	Harm Reduction	Low	Moderate	High

Description

The Monitoring HIT and EHR Goal Achievement assessment is a PDF document developed by the Health Information Technology Research Center (HITRC) and Stratis Health. **This tool is intended to aid providers and health IT implementers with meaningful use by helping a health care organization measure the extent to which health IT or EHR activities are adopted by intended users.**

This resource includes instructions to determine whether the results of goal achievement at key milestones suggest that users are making effective use of the health IT or EHR applications and whether processes are generally easier to perform. The tool can help a user identify areas in which health IT or EHR adoption could be improved, but does not give instruction on how to address these areas of improvement.

> ### Tools
> 🌐
> * [The Monitoring HIT and EHR Goal Achievement assessment](#)

Strengths

* Brief guidance on different data types to collect when monitoring EHR use and EHR issues
* Worksheet provided

Areas for Improvement

* Requires knowledge/use of SMART goals by the organization prior to **implementation** of a system to fully take advantage

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Locating a Tool

Guide to Reducing Unintended Consequences of EHRs

Phase of Impact			Estimated Effort		
Design and Implementation	Hazard Analysis	Harm Reduction	Low	Moderate	High

Description

The Guide to Reducing Unintended Consequences of EHRs is aimed toward current EHR users. The tool consists of several modules that contain Excel worksheets, recommended practices, case examples, and more.

Tools 🌐

- Guide to Reducing Unintended Consequences of EHRs

Module II: How to Avoid Unintended Consequences, Current EHR Users

- Failure Modes and Effects Analysis (FMEA) tutorial and case example

- Eight computerized physician order entry (CPOE) usage metrics that can be used by an organization to track the usage and functionality of an EHR

- Risks of copy and paste usage with link to the copy and paste toolkit developed by ECRI Institute

- Two case examples of the unintended consequences and organization frustrations with EHR software updates

Module III: Understand and Identify Unintended Consequences

- Interactive Sociotechnical Analysis (ISTA) framework description and specific EHR-related case examples for each element of the framework

- Links to other types of frameworks to provide a deeper understanding of these types of unintended consequences

- "Issues Log Template"—Microsoft Excel workbook intended to be a repository of EHR-related patient safety hazards for a practice to collect and address

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Guide to Reducing Unintended Consequences of EHRs *(continued)*

Module IV: Remediate Unintended Consequences

- Starter Set of Questions that can be used or adapted to identify the root causes of **EHR**-related challenges
- Links to multiple Root Cause Analysis (RCA) tools
- "Causal Statements and Corrective Actions"—Microsoft Excel template for keeping track of identifying and prioritizing actions
- "EHR-Related Problem Remediation Proposal Form"—Microsoft Word template used for developing a plan to remediate unintended consequences

Strengths

- Examples and case studies from health care settings
- Focuses on the unintended consequences of EHR-related challenges

Areas for Improvement

- Could provide more guidance on how to use FMEAs to improve EHR use

Locating a Tool

HIMSS Physician Community EHR Usability Pain Point Survey Webinar

Phase of Impact			Estimated Effort		
Design and Implementation	Hazard Analysis	Harm Reduction	Low	Moderate	High

Description

Starting with the experience of others can be beneficial in identifying **usability** issues in one's own **EHR** system. HIMSS conducted a survey with over 300 physicians to help identify and give insight into EHR usability. They disseminated the results of the survey during an hour-long webinar.

This webinar provides users with definitions and examples of typical usability issues and real-world provider insight into benefits and unintended consequences of EHRs, offering an avenue for users to see similarities in their own systems.

Tools 🌐

- HIMSS Physician EHR Usability Pain Point Survey

Strengths

- Overview of physician EHR usability frustrations across the United States

Areas for Improvement

- Webinar format is not as quickly digestible as other formats

- Does not focus on ways to address usability issues

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Locating a Tool

Optimization Strategies for Clinical Decision Support (CDS)

Phase of Impact			Estimated Effort		
Design and Implementation	Hazard Analysis	Harm Reduction	Low	Moderate	High

Description

This Word document comes from Stratis Health's Health Information Technology Toolkit. It focuses on clinical decision support (CDS), an important benefits of **EHRs**. **It provides background on different types of CDS and explains how complex each may be.** It also describes many strategies to consider if you're looking to improve your CDS. These strategies include increasing or decreasing the sensitivity of your alert settings and using CDS interventions in different ways throughout a clinician's **workflow**.

Tools 🌐

- Optimization Strategies for Clinical Decision Support (CDS)

Strengths

- Provides real-world pros and cons around changing alert sensitivity settings
- Describes several ideas for small practices to consider when thinking about optimizing their CDS

Areas for Improvement

- Some **optimization** strategies (like training users) lack detail

Locating a Tool

Planning for EHR Transition

Phase of Impact			Estimated Effort		
Design and Implementation	Hazard Analysis	Harm Reduction	Low	Moderate	High

Description

The HITEQ Center created this brief document to help you think carefully about your organization's **EHR** transition. **The document provides a list of important health center reporting requirements that practices should take into consideration when choosing a new EHR, as well as a link to a resource that can help you document your organization's current** workflows **in preparation for any changes that may happen.**

> ### Tools 🌐
> - EHR Transition Tips – Motivation and Planning

Strengths

- Brief document that provides a good overview of what to consider when transitioning systems

Areas for Improvement

- Could provide more details on how to incorporate the tips they recommend

Introduction and Examples	Preparing for Change	Problem Finding	Locating a Tool	Implementing a Solution	Additional Resources

Locating a Tool

Health Information Technology Evaluation Toolkit

Phase of Impact			Estimated Effort		
Design and Implementation	Hazard Analysis	Harm Reduction	Low	Moderate	High

Description

This PDF document from AHRQ guides users through the steps of planning an evaluation of the impact of their health IT projects. The document is broken down into three sections: Section I helps the user create measurable and realistic goals and figure out how to measure them, Section II provides a list of measures that could be used, and Section III contains examples of **implementation** projects. Measurement areas covered in the document include clinical outcomes, clinical process, provider adoption and attitude, patient adoption, workflow impact, and financial impact.

Tools 🌐
- Health IT Evaluation Toolkit

Strengths

- Provides many examples of potential measures users might consider when evaluating their system
- Could be used in all parts of the **EHR** lifecycle, such as evaluating a new intervention in a current system or a new system evaluation

Areas for Improvement

- Older document, some links are outdated
- Some of the evaluation techniques would be resource-intensive

Locating a Tool

Health IT-enabled Quality Improvement (eCQI) Worksheet

Phase of Impact			Estimated Effort		
Design and Implementation	Hazard Analysis	Harm Reduction	Low	Moderate	High

Description

This resource from the ONC and the National Learning Consortium is intended to help your organization document and analyze its approach to quality improvement (QI) projects. **The capabilities of an EHR can greatly enhance your QI project. This worksheet highlights this point and can guide you through the thought processes of creating and implementing a QI project.**

Tools 🌐
- Link to worksheet
- Link to example worksheet

Strengths

- Helpful example of the worksheet in use by an outpatient organization looking to improve blood pressure control in patients by utilizing CDS alerts

Areas for Improvement

- Doesn't explicitly focus on **health IT**, though understanding the **usability** and capabilities of the EHR are important for success

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Implementing a Solution

Introduction to Implementing a Solution

In this section, we will discuss change management, the importance of interdisciplinary teams, and potential unintended consequences.

▶ Planning to Implement and Evaluate a Solution

▶ Unintended Consequences of Health IT

Implementing a Solution

Planning to Implement and Evaluate a Solution

There is no single way to implement changes to an **EHR**. Your organization may use its own internally developed process and **workflow** to optimize your EHR, or you may use a more formal method like **Six Sigma** or **Lean**.

If your organization has limited experience in optimizing an EHR, the **Plan-Do-Study-Act (PDSA) cycle** offers one potential approach. The PDSA cycle provides a structure for learning that supports continual improvement of a product or process. You'll find links to resources with a detailed explanation of the PDSA cycle below.

In the PDSA cycle, it is critical that you constantly review any actions and monitor whether the changes have the desired impact on the system. This is especially true in EHR **optimization**; if your team has limited resources and **usability** experience, it may be challenging to predict whether your project will have the intended effect on your EHR. This can be addressed by identifying specific operational and clinical outcomes to measure before implementing changes to the EHR. For example, if a practice is focusing on improving the accuracy of quality metrics reporting, they could select both the time and number of clicks it takes to complete the metric as well as compliance with the overall metric to measure the impact of the planned intervention.

PDSA Resource Link

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Implementing a Solution

Unintended Consequences of Health IT

In a complex setting such as health care, it is impossible to predict every consequence of a change to the IT system. This means that implementing an **EHR** can sometimes lead to unintended negative consequences, such as an interface design that isn't clear to users or that doesn't provide access to critical information.[2, 7]

When making changes to your EHR, the team responsible should carefully plan and measure changes in the desired outcome, and meet with individuals who will be using the system before and after changes are introduced, to discuss the desired effects as well as potential unintended consequences.

Interviews with individuals who will use the system may help identify unintended consequences before you make any changes. For instance, if an EHR makes it time-consuming and difficult to write a tapering medication prescription, physicians may seek other, less time-consuming options such as pre-packaged tapering medications that may be more expensive. Likewise, if the changes to your EHR include designating a greater number of mandatory fields to meet reporting requirements, users may have reduced time for patient care or other documentation.

Although the **optimization** team shouldn't feel they must exhaust every avenue of analysis before making a change to the system, there should be a process in place to capture and reduce hazards from unintended consequences of the change.

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Additional Resources

Introduction to Additional Resources

In this section, you will find additional references and resources that may contain background information and advanced **usability** resources (some beyond the scope of the primary goal of this document).

- Basic Usability Resources
- Consulting Services
- Evidence
- Paper to EHR Transition
- Practice Transformation
- Quality Improvement
- Specific Reports or Tools
- Usability Testing Resources
- Glossary of Terms
- Bibliography

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Additional Resources

Basic Usability Resources

The following non-exhaustive list of resources can provide the reader with knowledge of basic **usability** guidelines or concepts:

A. Better EHR: Usability, Workflow, and Cognitive Support in Electronic Health Records

This E-book published by the National Center for Cognitive Informatics & Decision Making in Healthcare documents results from the ONC-funded SHARPC project, which is aimed at improving the usability and **cognitive support** of **EHRs**. Highlights include frameworks for EHR usability, methods for evaluating and designing EHR usability, and tools for clinical decision support. Additionally, frequently asked questions on **workflow** can be found here.

B. CCHIT 2011 Usability Testing Guide for Ambulatory EHRs

This resource is from the Certification Commission for Healthcare Information Technology, an organization that served as an EHR accreditation body for the ONC. The slide deck provides a general overview of CCHIT's usability certification evaluation process, including scales and questionnaires like the After-Scenario Questionnaire (ASQ), Perceived Usability (PERUSE) questions, and System Usability Scale (SUS) that are used by experts to judge the usability of an EHR product.

These scales and questionnaires can be used by a health care organization to understand what types of usability principles are important to an EHR certification body, and for general understanding of how an EHR is accredited.

C. Developing a Quality Program

The California Primary Care Association represents more than 800 nonprofit community clinics and health centers and is a member of the Cal-Regional Extension Center. This page on their website lists many resources concerning health care-specific QI tools like FMEAs, Lean, **PDSA**, Root Cause Analysis, Flow Charts, and Six Sigma. Scroll to the Quality Improvement Resources button.

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Additional Resources

Basic Usability Resources *(continued)*

D. EHR Science: Explorations in the Design and Implementation of Clinical Information Systems

This blog post encompasses a variety of issues related to **EHRs**, including usability, security risks, design best practices, and **implementation**/**optimization** challenges.

E. Electronic Health Record Information Design and Usability Toolkit

This is a final report from a project intended to design, develop, test, and disseminate a toolkit by which health care organizations—specifically primary care practices—can assess the usability of EHR systems. Important audiences for the toolkit also include **health IT** vendors and certification organizations. The report provides a thorough overview of usability and EHRs for readers unfamiliar with the terms and/or how usability of an EHR could be tested in their system. The report guides the reader through usability methods and common usability issues in the EHR.

F. Health Informatics Forum: Usability and Human Factors

This free online course authored by Columbia University consists of 27 lectures about rapid prototyping, user-centered design, the effects of new technology on **workflow**, and the facilitation of unit-wide focus groups or simulation.

G. Health IT Safety Center Roadmap: Education Sessions

ONC and RTI International presented 10 webinars from December 2014 to September 2015. The webinars encompass a wide range of health IT and safety topics, including information transparency, EHR documentation, EHR usability, improving diagnosis using health IT, CPOE and CDS, PSOs, interoperability, e-prescribing, and the role of health IT in safety. See in particular sessions 2, 5, 7, and 8.

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Additional Resources

Basic Usability Resources *(continued)*

H. *Inspired EHRs: Designing for Clinicians*

This interactive book by an expert on **EHR** usability is intended to show users good EHR design principles with examples that use clinical scenarios. *Inspired EHRs* focuses on five functions of an EHR: medication list, medication reconciliation, allergy list, e-prescribing, and drug alerts for ambulatory adult care practitioners.

This book was created particularly for EHR vendor teams who want to know more about **human factors** and design, but users in a health care organization could find the application of usability design principles in EHRs useful.

I. Technical Basis for User Interface Design of Health IT

This NIST report details the technical guidance provided for EHR developers to plan and implement a user-centered design and evaluation process. The NIST research team developed an EHR usability scoring system (EHRUS) that can be used to measure EHR usability.

J. Usability.gov

This website contains a vast amount of usability-related information. The resources include general guidelines, methods, templates, documents, and more.

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Additional Resources

Consulting Services

K. EHR Optimization and Workflow Consultants

Contact your vendor or other provider organizations in your region to identify consultants experienced with your vendor's **EHR** that can assist with optimizing your EHR implementation and EHR-enabled workflows. These consultants can identify best practices from other implementations, connect you to other similar provider organizations, and bring expertise that best leverages your EHR's implementation and configuration options.

L. HFES Directory of Human Factors/Ergonomics Consultants

This is a searchable directory of **human factors** and ergonomics consultants and experts who are also members of the Human Factors and Ergonomics Society. Individuals and companies are listed. These specialists and consultants may use standardized and validated tools like the System Usability Scale (SUS), a quick tool for measuring the usability of a wide variety of products and services. Details of the scale's use and scoring can be found here.

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Additional Resources

Evidence

M. Investigations of Health IT-related Deaths, Serious Injuries, or Unsafe Conditions

This report from the Joint Commission that identifies and categorizes **health IT**-related sentinel events provides evidence that health IT is involved in serious patient safety events. The report also describes the knowledge gained from the authors' "learning visits" to four Joint Commission accredited medical centers. Joint Commission staff gathered information about how health IT is used in the hospital, including its organization, integration, and unintended risks or consequences.

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Additional Resources

Paper to EHR Transition

Many tools were developed to support health care organizations or practices transitioning from a paper system to an **EHR**. Some of these tools may be helpful for organizations seeking improvement of their system and are included below.

N. Chart Migration and Scanning Checklist

This document was developed from the experiences of Regional Extension Center (REC) staff involved in technical support and EHR **implementation** assistance. The Chart Migration and Scanning Checklist is intended to aid providers and health IT implementers in determining what information from the paper records they need to import into their new EHR.

O. Workflow Process Mapping for Electronic Health Record (EHR) Implementation

These guidelines from the Health IT Playbook are intended for providers and **health IT** implementers who are planning for EHR implementation. The document describes how and why to create a practice **workflow** analysis and redesign. This process could be a useful tool for those with an EHR already in place to highlight office inefficiencies and care coordination.

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Additional Resources

Practice Transformation

P. American Medical Association (AMA) STEPS Forward

This practice transformation resource is aimed at improving practice efficiency and meeting the tenets of the Quadruple Aim—achieving better patient experience, better population health, and lower overall costs, with improved professional satisfaction.

Q. Office of the National Coordinator (ONC) Health IT Playbook

This resource provides essential information on using **health IT** to help practices work more efficiently and effectively.

Additional Resources

Quality Improvement

R. Continuous Quality Improvement (CQI) Strategies to Optimize your Practice

This primer introduces Continuous Quality Improvement (CQI) concepts, strategies, and techniques a practice can use to design an effective CQI strategy for EHR **implementation**, achieve meaningful use of the system, and ultimately improve the quality and safety of patient care.

S. eCQM Tools & Key Resources

This online collection of tools and resources is related to electronic clinical quality measurement. The tools are categorized by their use in the development, testing, certification, implementation, reporting, and continuous evaluation of quality measures and their improvement. This is a useful website for users interested in utilizing their **EHR** to improve upon their quality measurement and reporting.

T. Data Monitoring: Yearly UDS Data Dashboard

This Excel file dashboard was created by an existing Federally Qualified Health Center (FQHC) and is used to depict performance on various measures over time. The user can replace data to suit their organizational needs. The tool provides a way for users to utilize their EHR to monitor performance on uniform data system measures.

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Additional Resources

Specific Reports or Tools

The list below includes resources that target a specific or associated area of health IT.

U. NISTIR 7988: Integrating Electronic Health Records into Clinical Workflow: An Application of Human Factors Modeling Methods to Ambulatory Care

NISTIR 7988 describes the results of using two **human factors workflow** modeling tools—process mapping and goal-means decomposition—to collect, visualize, and document insights and end-user needs to improve EHR workflow for clinicians in the ambulatory setting. The report provides specific recommendations that are particularly relevant to the outpatient setting. The authors also thoroughly describe their process for using human factors techniques to identify and suggest improvements to the **EHR**.

V. NISTIR 8042: Integrating Electronic Health Records into Clinical Workflow: An Application of Human Factors Modeling Methods to Obstetrics and Gynecology and Ophthalmology

NISTIR 8042 describes the results of using two human factors workflow modeling tools, process mapping and goal-means decomposition, to collect, visualize, and document insights and end-user needs to improve EHR workflow for OB-GYN and ophthalmology clinicians. The report provides specific recommendations that are particularly relevant to obstetrics and ophthalmology clinicians. The authors also thoroughly describe their process for using human factors techniques to identify and suggest improvements to the EHR.

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Additional Resources

Specific Reports or Tools *(continued)*

W. NISTIR 8095: Electronic Health Record Design Considerations in Responding to Incidences of Highly Infectious Diseases: Clinical Workflows and Exception Handling

NISTIR 8095 describes insights related to patient safety and **workflow** from infectious disease experts as a result of their experiences treating individuals with an infectious disease. This includes recommendations to improve the visibility of the patient's overall history and easily interpretable vaccination history in the **EHR**.

X. NISTIR 8166: Examining the "Copy and Paste" Function in the Use of Electronic Health Records

NISTIR 8166 describes the results of a usability test of EHR to examine and understand the implications of the "copy and paste" functionality. The authors describe their major findings from the study, as well as additional findings from a **human factors** assessment of the data. They also provide specific recommendations for the user interface design of the EHR (e.g., (1) enhance the visibility of the information being selected for "copy and paste," (2) provide a concept for reconciling that the copied information was read consciously and edited by the clinical provider, and (3) certain areas must be locked from copying). The authors describe several other human factors recommendations related to the results of their studies.

Y. Team Documentation, American Medical Association (AMA)

The Team Documentation module from the AMA is intended to help providers implement team documentation. Relevant tools include a document for logging time spent on administrative tasks, a checklist for implementing team documentation, and examples of the tools in practice.

Z. Clinical Decision Support and Diagnostic Imaging (AMA)

This module provides five STEPS Forward—AMA's practice transformation series to explore evidence-based CDS tools and prepare to use them in your practice—and answers to questions about adopting CDS tools for appropriate imaging. It also offers three additional tools to help your team make better imaging decisions.

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Additional Resources

Usability Testing Resources

There are a number of specific tools that usability professionals rely on when testing different aspects of a system. These include (but are not limited to) the following.

AA. System Usability Scale (SUS)

The System Usability Scale (SUS) is a quick tool for measuring the usability of a system, hardware, software, website, etc. The SUS has been validated and is widely used by **usability** experts. This tool provides an overview of SUS and resources on how to interpret SUS scores.

BB. Measuring Task Load: NASA Task Load Index (TLX)

The NASA Task Load Index (TLX) is a workload assessment tool that allows users to assess task load or burden based on the mental and overall workload score of human-machine interface systems based on the mental demand, physical demand, temporal demand, performance, effort, and frustration of the human. NASA TLX is widely used as a workload measurement tool across industries and is available as a printable PDF document for paper-and-pencil use, or as a mobile application.

CC. Development of a Customizable Health IT Usability Evaluation Scale (Health-ITUES)

This journal article from Columbia University researchers describes their development of a customizable questionnaire intended to evaluate the usability of **health IT**. The four factors considered in the Health-ITUES are the quality of work life, perceived usefulness, perceived ease of use, and user control.

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Additional Resources

Glossary of Terms

Cognitive support: An aid to help reduce the mental workload of an individual or team.

Customization: Specific changes or alterations a health care system can make to its EHR. These changes can make the EHR more efficient and better in a specific work environment or context. Without proper planning, sometimes these changes may also negatively affect the usability of the final system.

Electronic health record (EHR): An electronic system that stores patients' health information and provider orders and instructions.

Health information technology (health IT): A general term used to describe the various technologies that exist to store, share, and analyze health information. Electronic health records are one example of health IT.

Heuristics: Simple rules, guidelines, or strategies that serve as shortcuts to make the judgment and decision making process easier and quicker.

Human factors: A way to design tools, machines, systems, tasks, jobs, and environments that takes into consideration the abilities and limitations of humans. This approach (and area of study) ensures that people can accomplish tasks in a safe, comfortable, and effective way.

Implementation: The phase in which the EHR is installed and introduced to the health care system. This phase includes activities such as training, pilot testing, and "go-live."

Near-miss: Hazardous situations or events that do not affect the patient because of chance or active recovery efforts by caregivers.

Optimization: The action of maximizing the use of or refining the software to best fit the practice needs.

ONC Change Package for Improving EHR Usability

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Additional Resources

Glossary of Terms *(continued)*

Plan-Do-Study-Act (PDSA) cycle: According to the Institute for Healthcare Improvement (IHI), this is "a tool designed to help healthcare systems implement a change. Designed to document the testing of change, its four-step cycle involves developing a plan to test the change (Plan), carrying out the test (Do), observing and learning from the consequences (Study), and determining what modifications should be made to the plan (Act)." See the IHI worksheet.

Standardization: Using a consistent set of options, features, or settings recommended by an EHR vendor or subject matter expert to provide a consistent user experience that ideally has been tested and/or optimized.

Usability: The measure of how easy, efficient, and practical it is to use a product to accomplish a task.

Workflow: The process in which designated tasks are to be completed through a work system or organizational structure.

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Additional Resources

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Additional Resources

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About This Usability Change Package

Within This Guide

Throughout this change package, we use the following conventions:

Navigation	
▶	Circles with arrows indicate list links to sections within the change package
🔖	Ribbons indicate within-text (bookmarked) links for items within the change package
🌐	World icons indicate links to external web-based resources

Problem Finding	The case studies contain structured content with: • Descriptions, • Toolkit items, and • Examples.
Locating a Tool	The resources in the "Locating a Tool" section contain structured content with: • Estimates on targeted phase of impact and effort, • A description, • Links to external web-based tools, • Key strengths, and • Areas for improvement.

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About this Usability Change Package

This resource was created primarily to support both individual practices and hospital environments with limited resources or experience needed to support usability-related improvements to their EHR systems. This Usability Change Package (UCP) provides links to a variety of existing, publicly available resources and provides background information to assist users in matching a problem to a resource, preparing to implement a change, or finding additional resources for the more experienced usability practitioner. Some of these resources are more active, like ▌AMA's STEPS Forward or the ▌ONC Health IT Playbook, with frequent updates and broad application. Resources restricted from public access, such as those behind a paywall (at the time of final editing) or available through software system vendors were not included in the UCP.

This resource focuses primarily on EHR use cases and does not focus on patient portals, ancillary systems, or other forms of health IT. Discussion of future work on this UCP identified advantages of a more interactive community-sourced product that incorporates feedback received from those who use it.

RTI led the development of this UCP in collaboration with MedStar and Clinovations under ONC contract #HHSP233201500039I. During development, input was received from a technical expert panel that included representatives from the federal government, usability experts and consultants, health systems, professional societies, universities, and the vendor community.

This UCP was last updated February 2018.

The current version of this UCP is **Version 1, February 2018**.

Please visit https://www.healthit.gov/playbook/feedback/ if you have any questions or concerns about this UCP.