Self-Assessment

Computerized Provider Order Entry with Decision Support

General Instructions for the SAFER Self-Assessment Guides

The SAFER Guides are designed to help healthcare organizations conduct self-assessments to optimize the safety and safe use of electronic health records (EHRs) in the following areas.

- High Priority Practices
- Organizational Responsibilities
- Contingency Planning
- System Configuration
- System Interfaces
- Patient Identification
- Computerized Provider Order Entry with Decision Support
- Test Results Reporting and Follow-up
- Clinician Communication

Each of the nine SAFER Guides begins with a Checklist of recommended practices. The downloadable SAFER Guides provide fillable circles that can be used to indicate the extent to which each recommended practice has been implemented. Following the Checklist, a Practice Worksheet gives a rationale for and examples of how to implement each recommended practice, as well as likely sources of input into assessment of each practice, and fillable fields to record team members and follow-up action. In addition to the downloadable version, the content of each SAFER Guide, with interactive references and supporting materials, can also be viewed on ONC's website at www.healthit.gov/SAFERGuide.

The SAFER Guides are based on the best evidence available at this time (2016), including a literature review, expert opinion, and field testing at a wide range of healthcare 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. However, every organization faces unique circumstances and will implement a particular practice differently. As a result, some of the specific examples in the SAFER Guides for recommended practices may not be applicable to every organization.

The SAFER Guides are designed in part to help deal with safety concerns created by the continuously changing landscape that healthcare organizations face. Therefore, changes in technology, practice standards, regulations and policy should be taken into account when using the SAFER Guides. Periodic self-assessments using the SAFER Guides may also help organizations identify areas in which it is particularly important to address the implications of change for the safety and safe use of EHRs. Ultimately, the goal is to improve the overall safety of our health care system.

The SAFER Guides are not intended to be used for legal compliance purposes, and implementation of a recommended practice does not guarantee compliance with HIPAA, the HIPAA Security Rule, Medicare or Medicaid Conditions of Participation, or any other laws or regulations. The SAFER Guides are for informational purposes only and are not intended to be an exhaustive or definitive source. They do not constitute legal advice. Users of the SAFER Guides are encouraged to consult with their own legal counsel regarding compliance with Medicare or Medicaid program requirements, HIPAA, and any other laws.

For additional, general information on Medicare and Medicaid program requirements, please visit the Centers for Medicare & Medicaid Services website at www.cms.gov. For more information on HIPAA, please visit the HHS Office for Civil Rights website at www.hhs.gov/ocr.

Self-Assessment

Computerized Provider Order Entry with Decision Support

Introduction

The *Computerized Provider Order Entry with Decision Support SAFER Guide* identifies recommended safety practices associated with computerized provider order entry (CPOE) and clinical decision support (CDS). Completing this self-assessment in collaboration with a multi-disciplinary team will help an organization optimize the safety and safe use of CPOE with CDS in the EHR. The implementation and use of CPOE with CDS is complex and fragile, requiring careful planning, implementation, and maintenance to function properly. In the EHR-enabled healthcare environment, providers rely on technology to support and manage the complex processes related to CPOE with CDS, and this reliance creates potential safety risks that can be minimized by the adoption of the recommended practices in this guide.

The use of CPOE with CDS can improve medication safety as well as ensure that providers who electronically order diagnostic tests and consultations remain in the communication loop.[1, 2, 3, 4, 5, 6, 7, 8, 9, 10] However, certain CPOE-related practices can create safety risks.[11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30] For example, partial adoption of CPOE, or a lack of CPOE monitoring (e.g., incomplete data entry, excessive use of free text), can create hazardous conditions.

CDS, whether stand-alone or integrated within an EHR, is designed to aid the clinical decision-making process at the point of care. The current scope of CDS focuses primarily on medications, laboratory testing, radiology procedures, and clinical references literature.[31] Substantial evidence suggests that well-designed CDS not only enhances the quality of care, but directly improves patient safety by decreasing common errors and preventing omissions or missed opportunities that result in patient harm.[3, 32, 33, 34, 35] In spite of this, poorly implemented EHR systems have been shown to introduce errors that adversely affect care.[11, 15, 20, 25, 36, 37, 38, 39, 40]

Completing the self-assessment in the Computerized Provider Order Entry with Decision Support SAFER Guide requires the engagement of people both within and outside of the organization (e.g., EHR technology developers, diagnostic services providers). Because this guide is designed to help organizations prioritize EHR-related safety concerns, clinician leadership in the organization should be engaged in assessing whether and how any particular recommended practice affects the organization's ability to deliver safe, high quality care.[41]

Collaboration between clinicians and staff members while completing the self-assessment in this guide will enable an accurate snapshot of the organization's CPOE and CDS status, in terms of safety. Even more importantly, collaboration should lead to a consensus about the organization's future path to optimize EHR-related safety and quality: setting priorities among the recommended practices not yet addressed, ensuring a plan is in place to maintain recommended practices already in place, dedicating the required resources to make necessary improvements, and working together to mitigate the CPOE-related safety risks introduced by the EHR.

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Computerized Provider Order Entry with Decision Support

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The SAFER Self-Assessment Guides were developed by health IT safety researchers and informatics experts:

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The *Checklist* is structured as a quick way to enter and print your self-assesment. Your selection on the checklist will automatically update the related section of the corresponding *Recommended Practice Worksheet*.

The *Domain* associated with the *Recommended Practice(s)* appears at the top of the column.

The *Recommended Practices(s)* for the topic appear below the associated *Domain*.

Select the level of implementation achieved by your organization for each *Recommended Practice.*

Your *Implementation Status* will be reflected on the *Recommended Practice Worksheet* in this PDF.

To the right of each *Recommended Practice* is a link to the *Recommended Practice Worksheet* in this PDF.

The Worksheet provides guidance on implementing the Practice.

*Recommended Practices for **Domain 1 — Safe Health IT***

			Implementation Status			
			Fully in all areas	Partially in some areas	Not implemented	
1.1	Coded allergen and reaction information (or "no known allergies" [NKA]) are entered and updated in the EHR prior to any order entry.	Worksheet 1.1	○	○	○	reset
1.2	Evidence-based order sets are available in the EHR for common tasks and conditions and are updated regularly.	Worksheet 1.2	○	○	○	reset
1.3	User-entered orderable items are matched to, or can be looked up from, a list of standard terms.	Worksheet 1.3	○	○	○	reset
1.4	The EHR can facilitate both cancellation and acknowledgment of receipt of orders for laboratory, radiology, and pharmacy.	Worksheet 1.4	○	○	○	reset
1.5	CDS alerts are displayed in the relevant clinical context.	Worksheet 1.5	○	○	○	reset
1.6	CDS incorporates current best practices and guidelines from authoritative sources (e.g., national organizations, medical specialty professional associations).	Worksheet 1.6	○	○	○	reset

*Recommended Practices for **Domain 2 — Using Health IT Safely***

			Implementation Status			
			Fully in all areas	Partially in some areas	Not implemented	
2.1	Clinicians are trained and tested on CPOE operations before being issued login credentials.	Worksheet 2.1	○	○	○	reset
2.2	Clinicians are engaged in implementing, reviewing, and updating CDS.	Worksheet 2.2	○	○	○	reset
2.3	CPOE is used for ordering all medications, diagnostic tests, and procedures for which CPOE is available.	Worksheet 2.3	○	○	○	reset
2.4	There is minimal use of free-text order entry. Orders are entered and stored in standardized, coded form.	Worksheet 2.4	○	○	○	reset
2.5	Order entry information is electronically communicated (e.g., through the computer or mobile messaging) to the people responsible for carrying out the order.	Worksheet 2.5	○	○	○	reset

*Recommended Practices for **Domain 2 — Using Health IT Safely***

			Implementation Status			
			Fully in all areas	Partially in some areas	Not implemented	
2.6	Interruptive alerts (e.g., pop-ups at the time of ordering) are used with discretion and only for high risk, high priority conditions.	Worksheet 2.6	○	◉	○	reset
2.7	Drug-allergy interaction checking occurs during the entry of new medication orders and new allergies.	Worksheet 2.7	○	◉	○	reset
2.8	Duplicate order checking occurs for high risk medication, diagnostic tests, and procedure orders (excluding "as needed" [PRN] medications).	Worksheet 2.8	○	◉	○	reset
2.9	Drug-condition checking occurs for important interactions between drugs and selected conditions.	Worksheet 2.9	○	◉	○	reset
2.10	Drug-patient age checking occurs for important age-related medication issues.	Worksheet 2.10	○	◉	○	reset
2.11	Dose range checking (e.g., maximum single dose or daily dose) occurs before medication orders are submitted for dispensing.	Worksheet 2.11	○	◉	○	reset
2.12	A process is in place to review interactions so that only the most significant interaction-related alerts, as determined by the organization, are presented to clinicians.	Worksheet 2.12	○	◉	○	reset
2.13	Clinicians are required to re-enter their password, or a unique PIN, to “sign” (authenticate) an order.	Worksheet 2.13	○	◉	○	reset
2.14	When appropriate, corollary (or consequent) orders are automatically suggested and linked together with the original order such that changes are reflected when the original order is rescheduled, renewed, or discontinued.	Worksheet 2.14	○	◉	○	reset
2.15	Users can access authoritative clinical reference materials directly from the EHR, including organization-specific information when available.	Worksheet 2.15	○	◉	○	reset
2.16	CPOE and CDS functionality are tested to ensure proper operation before go-live and with test patients in the production system before clinical use.	Worksheet 2.16	○	◉	○	reset

*Recommended Practices for **Domain 2 — Using Health IT Safely***

			Implementation Status			
			Fully in all areas	Partially in some areas	Not implemented	
2.17	Questions presented to the user by CPOE or CDS are unambiguous.	*Worksheet 2.17*	○	○	○	reset
2.18	CPOE and CDS implementation and use are supported by usability testing based on best practices from human factors engineering.	*Worksheet 2.18*	○	○	○	reset
2.19	Critical patient information is visible during the order entry process.	*Worksheet 2.19*	○	○	○	reset
2.20	The clinician is informed during the ordering process when additional steps are needed to complete the order being requested.	*Worksheet 2.20*	○	○	○	reset
2.21	Use of abbreviations and acronyms is minimized and standardized.	*Worksheet 2.21*	○	○	○	reset
2.22	Additional safeguards (e.g., double checking by a second specialist) are implemented in the EHR before high risk medications are prescribed.	*Worksheet 2.22*	○	○	○	reset

*Recommended Practices for **Domain 3 — Monitoring Safety***

			Implementation Status			
			Fully in all areas	Partially in some areas	Not implemented	
3.1	Key metrics related to CPOE and CDS (e.g., override rates) are defined, monitored, and acted on to optimize safety and use.	*Worksheet 3.1*	○	○	○	reset

A multi-disciplinary team should complete this self-assessment and evaluate potential health IT-related patient safety risks addressed by this specific SAFER Guide within the context of your particular healthcare organization.

This Team Worksheet is intended to help organizations document the names and roles of the self-assessment team, as well as individual team members' activities. Typically, team members will be drawn from a number of different areas within your organization, and in some instances, from external sources. The suggested Sources of Input section in each Recommended Practice Worksheet identifies the types of expertise or services to consider engaging. It may be particularly useful to engage specific clinician and other leaders with accountability for safety practices identified in this guide.

The Worksheet includes fillable boxes that allow you to document relevant information. The Assessment Team Leader box allows documentation of the person or persons responsible for ensuring that the self-assessment is completed. The section labeled Assessment Team Members enables you to record the names of individuals, departments, or other organizations that contributed to the self-assessment. The date that the self-assessment is completed can be recorded in the Assessment Completion Date section and can also serve as a reminder for periodic reassessments. The section labeled Assessment Team Notes is intended to be used, as needed, to record important considerations or conclusions arrived at through the assessment process. This section can also be used to track important factors such as pending software updates, vacant key leadership positions, resource needs, and challenges and barriers to completing the self-assessment or implementing the Recommended Practices in this SAFER Guide.

Assessment Team Leader

Assessment Completion Date

Assessment Team Members

Assessment Team Notes

reset page

Each *Recommended Practice Worksheet* provides guidance on implementing a specific *Recommended Practice*, and allows you to enter and print information about your self-assessment.

The *Rationale* section provides guidance about "why" the safety activities are needed.

Enter any notes about your self-assessment.

Enter any follow-up activities required.

Enter the name of the personal responsible for the follow-up activities.

The *Suggested Sources of Input* section indicates categories of personnel who can provide information to help evaluate your level of implementation.

The *Examples* section lists potentially useful practices or scenarios to inform your assessment and implementation of the specific *Recommended Practice*.

Recommended Practice

1.1 Coded allergen and reaction information (or "no known allergies" [NKA]) are entered and updated in the EHR prior to any order entry.[42]
Checklist

Implementation Status

Off

Rationale for Practice or Risk Assessment

One of the main purposes of CDS is automated drug-allergy checking, which requires coded entry of allergies in the EHR.

Suggested Sources of Input

Clinicians, support staff, and/or clinical administration

EHR developer

Examples of Potentially Useful Practices/Scenarios

- Users are reminded to enter patients' allergies or "no known allergies" before entering any medication orders.
- A standard, controlled vocabulary of allergens and reactions (e.g., SNOMED-CT) is available and used.
- There is a defined hierarchy of authority to edit or remove allergy-related information from a patient's EHR.
- The EHR system permits entry of medication intolerances, distinguished from true allergies.

Assessment Notes

Follow-up Actions

Person Responsible for Follow-up Action

reset page

Recommended Practice

1.2 Evidence-based order sets are available in the EHR for common tasks and conditions and are updated regularly.[43]
Checklist

Implementation Status

Off

Rationale for Practice or Risk Assessment

Order sets minimize errors of omission through standardization. Requiring clinicians to enter each of the individual orders for routine clinical practices increases the risk of overlooking one or more items.

Assessment Notes

Follow-up Actions

Person Responsible for Follow-up Action

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Suggested Sources of Input

Clinicians, support staff, and/or clinical administration

EHR developer

Pharmacy

Examples of Potentially Useful Practices/Scenarios

- Order sets for medications are developed on the basis of Institute for Safe Medication Practices (ISMP) guidelines.[44] Similar standard formatting approaches are used for developing diagnostic test- and procedure-related order sets.
- Order sets exist for the ten most common clinical conditions (e.g., management of chest pain), procedures (e.g., insulin administration and monitoring), and clinical services (e.g., admission to labor and delivery).[45]
- Clinical content is developed or modified based on evidence from authoritative sources (e.g., the AHRQ CDS Initiative, specialists within the organization).
- EHR developer-provided clinical content is based on authoritative sources and is reviewed for accuracy on a regular basis, and the EHR's software is upgraded whenever those sources are updated.
- Order sets for medications include complete pre-written medication orders (order sentences) that include dose (unless the dose should be modified based on patient data, such as blood pressure, creatinine clearance, or blood glucose), dose form when necessary, route of administration, frequency, and a PRN flag and indication, if appropriate.[42]
- Pre-written medication orders use doses that are weight-based, when appropriate.
- Personalized order sets should be used sparingly. If an organization permits them, there is an annual review process (e.g., clinical quality committee or medical director approval).[45]
- Medications requiring complex dosing guidelines (e.g., insulin sliding scale) are standardized and available electronically.
- The CPOE list of orderable items (i.e., medication dictionary or orderable catalog) includes all formulary medications to reduce the necessity of entering free-text orders.
- The CPOE list of orderable items includes acceptable, non-formulary medications, which are clearly marked, that users can order for out-of-formulary fulfillment.
- Prescribing systems for children use weight-based dosing recommendations, age-appropriate dosing calculators and dose-range checking, and pediatric-specific drug-drug interaction alerts.[46]

Recommended Practice

1.3 User-entered orderable items are matched to, or can be looked up from, a list of standard terms.[47]
Checklist

Implementation Status

Off

Rationale for Practice or Risk Assessment

CDS is important to patient safety. CDS can be supported by orders of standardized items, but not on free-text orders.

Suggested Sources of Input

Clinicians, support staff, and/or clinical administration

EHR developer

Pharmacy

Examples of Potentially Useful Practices/Scenarios

- Users' orders are matched to a codified set of orderable items (e.g., medications, laboratory and radiology tests).
- The EHR's search facility should support various word orders (e.g., “abdominal ultrasound” or “ultrasound, abdominal”), various names (e.g., generic, brand, synonym), and should be able to be browsed alphabetically.[48]

Assessment Notes

Follow-up Actions

Person Responsible for Follow-up Action

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Recommended Practice

1.4 The EHR can facilitate both cancellation and acknowledgment of receipt of orders for laboratory, radiology, and pharmacy. *Checklist*

Implementation Status

Off

Rationale for Practice or Risk Assessment

Communication errors, especially related to medication orders and diagnostic services, are frequent occurrences. Order tracking can reduce these errors.

Suggested Sources of Input

- Diagnostic services EHR developer
- Health IT support staff
- Pharmacy

Examples of Potentially Useful Practices/Scenarios

- The user can look up whether the lab has received the specimen for testing or not.
- When medication orders are cancelled, information is received and acted on appropriately by the responsible pharmacy.[49, 50]
- The two-way interfaces that facilitate order tracking are tested pre- and post-go-live.

Assessment Notes

Follow-up Actions

Person Responsible for Follow-up Action

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Recommended Practice

1.5 CDS alerts are displayed in the relevant clinical context.[40, 51, 52, 53, 54, 55, 56, 57, 58]

Checklist

Implementation Status

Off

Rationale for Practice or Risk Assessment

CDS to improve diagnostic or therapeutic decision making should be accessible in real time at the point of care; otherwise, the advice generated may be useless or underutilized.[59] Risks include information overload and clinician dissatisfaction.[3, 33, 34]

Assessment Notes

Follow-up Actions

Person Responsible for Follow-up Action

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Suggested Sources of Input

Clinicians, support staff, and/or clinical administration

EHR developer

Health IT support staff

Examples of Potentially Useful Practices/Scenarios

- A process is in place to identify and remove alerts that do not make sense in the particular clinical context. In some cases, the process may require communication with the EHR developer.
- Ambulatory alerts for cancer screening protocols should not be presented during the inpatient stay.[60, 61] The discharge time period may be more appropriate for this type of CDS.
- Alerts for diabetic foot screening should not be presented for patients with bilateral lower extremity amputations.

Recommended Practice

1.6 CDS incorporates current best practices and guidelines from authoritative sources (e.g., national organizations, medical specialty professional associations).[62]
Checklist

Implementation Status

Off

Rationale for Practice or Risk Assessment

Out of date or incorrect knowledge provided by the CDS system may be harmful.[3, 33, 34]

Suggested Sources of Input

Clinicians, support staff, and/or clinical administration

EHR developer

Health IT support staff

Examples of Potentially Useful Practices/Scenarios

- For organizations that rely on EHR developer-provided CDS, a process is in place to ensure that CDS is based on authoritative sources and is regularly updated.
- The evidence supporting CDS is reviewed and approved by EHR users before adoption.
- Authoritative sources such as AHRQ's CDS Initiative and professional associations are used to develop CDS content. For example:
  - Colon cancer screening reminders follow U.S. Preventive Services Task Force guidelines.[63]
  - Vaccination reminders use the latest recommendations from the Advisory Committee on Immunization Practices.[64]
  - Consider the "Choosing Wisely" guidelines to reduce unnecessary tests and procedures.[65, 66, 67]

Assessment Notes

Follow-up Actions

Person Responsible for Follow-up Action

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Recommended Practice

2.1 Clinicians are trained and tested on CPOE operations before being issued login credentials.[50]
Checklist

Implementation Status

Off

Rationale for Practice or Risk Assessment

CPOE is a complex tool. To maximize its safe and effective use, clinicians must be trained rigorously and should not be expected to "learn the basics on the job."

Assessment Notes

Follow-up Actions

Person Responsible for Follow-up Action

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Suggested Sources of Input

Clinicians, support staff, and/or clinical administration

Pharmacy

EHR developer

Health IT support staff

Examples of Potentially Useful Practices/Scenarios

- Incentives such as continuing education (e.g., CME, CEU) credits are awarded to clinicians who have been trained on CPOE.
- Clinicians are required to demonstrate basic CPOE skills before getting their login credentials.[68]
- The organization evaluates whether specialized CPOE training should be required in high risk areas.
- Training is reinforced periodically, particularly with system changes and upgrades.

Recommended Practice

2.2 Clinicians are engaged in implementing, reviewing, and updating CDS.[62, 69, 70, 71, 72, 73]
Checklist

Implementation Status

Off

Rationale for Practice or Risk Assessment

Failure to include clinicians in decisions that affect their clinical work environment, their decision making capabilities, or how their decisions are communicated and recorded significantly increases the risk of hazardous events. CDS systems can be optimized through monitoring of use, overrides, and clinician satisfaction.

Assessment Notes

Follow-up Actions

Person Responsible for Follow-up Action

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Suggested Sources of Input

Clinicians, support staff, and/or clinical administration
Diagnostic services
Pharmacy

Examples of Potentially Useful Practices/Scenarios

- Clinicians are involved in developing and maintaining CDS content consistent with updated guidelines and algorithms. There is a process that involves clinicians in managing, evaluating, and prioritizing CDS updates.[62, 72, 73, 74, 75]
- Developing and maintaining high quality CDS interventions is difficult and time consuming.[41] The organization should incentivize, or otherwise reward, clinicians for their time spent working on CDS-related activities.
- Clinician-provided feedback is reviewed and used for refinement and maintenance of CDS and the relevant clinical content.[62, 71, 72, 73, 75]
- Clinician overrides (i.e., decisions not to follow a computer-generated suggestion) for high priority CDS elements are logged and available for review and reporting.[76, 77, 78]
- For EHR developer-provided or -controlled CDS, a process is in place to communicate the need for CDS improvements with the developer.
- Compendia CDS and clinical terminology updates should be done on a frequent and regular basis. Doing this enables prescribers to have access to the most up-to-date information at all times.

Recommended Practice

2.3 CPOE is used for ordering all medications, diagnostic tests, and procedures for which CPOE is available.[43]
Checklist

Implementation Status

Off

Rationale for Practice or Risk Assessment

While full use of CPOE with advanced CDS has been shown to reduce errors,[59] partial use of CPOE can introduce errors.

Assessment Notes

Follow-up Actions

Person Responsible for Follow-up Action

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Suggested Sources of Input

Clinicians, support staff, and/or clinical administration
Diagnostic services
EHR developer
Health IT support staff
Pharmacy

Examples of Potentially Useful Practices/Scenarios

- Except in unusual situations, providers are required to enter their orders into the CPOE system. This includes orders for controlled substances.
- Exceptions (e.g., emergency orders in resuscitation situations) are clearly defined, and processes are in place and followed for their proper documentation in the EHR.
- Recommendations from The Joint Commission are followed when submitting orders to RNs by text messaging. This is acceptable as long as the texting platform has:[79]
  - A secure sign-on process
  - Encrypted messaging
  - Delivery and read receipts
  - Date and time stamps
  - Customized message retention time frames
  - A specified contact list for individuals authorized to receive and record orders

Recommended Practice

2.4 There is minimal use of free-text order entry. Orders are entered and stored in standardized, coded form.[43, 80, 81]
Checklist

Implementation Status

Off

Rationale for Practice or Risk Assessment

Free-text data can introduce errors if it is inconsistent with structured data or is not used or communicated properly.[50] Free-text orders cannot be effectively supported with CDS.

Suggested Sources of Input

Clinicians, support staff, and/or clinical administration

EHR developer

Health IT support staff

Examples of Potentially Useful Practices/Scenarios

- When medications are entered using standardized, coded terms, corresponding narrative text is minimized. Processes are in place to ensure timely use and review of any narrative text.
- The organization takes specific safety precautions whenever full free-text ordering is allowed.
- When medications must be ordered using free text, as constrained by organizational policy, a pharmacist reviews the order to identify and address any drug-drug or drug-allergy interactions.

Assessment Notes

Follow-up Actions

Person Responsible for Follow-up Action

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Recommended Practice

2.5 Order entry information is electronically communicated (e.g., through the computer or mobile messaging) to the people responsible for carrying out the order.[82]
Checklist

Implementation Status

Off

Rationale for Practice or Risk Assessment

For effective CPOE, orders must be electronically communicated. An automated process minimizes lapses in communication.

Suggested Sources of Input

Clinicians, support staff, and/or clinical administration

EHR developer

Health IT support staff

Examples of Potentially Useful Practices/Scenarios

- In-patient nurses are notified via the EHR when new results or orders are entered into the system for one of their patients (e.g., when they login to the system an alert tells them that new orders are available, or they are sent an informative page or text message).[83]
- In the ambulatory setting, clinical workflow is evaluated and optimized to ensure that nursing and other support staff responsible for carrying out orders are alerted to the presence of new orders. Examples of alerts could be a task in-box, messages on the edge of the screen, alerts at log on, text messages, or pages.
- Orders that are not acknowledged by the individual responsible for carrying them out within appropriately defined time periods are automatically escalated to a supervisor.[84]
- Workflow is evaluated to ensure that all electronic orders go to the intended recipient and that person documents their actions in the EHR.

Assessment Notes

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Person Responsible for Follow-up Action

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Recommended Practice

2.6 Interruptive alerts (e.g., pop-ups at the time of ordering) are used with discretion and only for high risk, high priority conditions.[40, 51, 52, 53, 54, 55, 56, 72, 85, 86]

Checklist

Implementation Status

Partially in some areas

Rationale for Practice or Risk Assessment

Excessive use of interruptive alerts creates clinician dissatisfaction and reduces their effectiveness, causing clinicians to miss important alerts.[31]

Suggested Sources of Input

Clinicians, support staff, and/or clinical administration

EHR developer Health IT support staff

Examples of Potentially Useful Practices/Scenarios

- For lower priority conditions, passive alerts that do not force an interruption of workflow are available.[54]
- High risk, high priority conditions that justify interruptive alerts are identified by clinicians and are subject to review.
- Interruptive alerts at the point of care are used only after considering other available options.[87]

Assessment Notes

Follow-up Actions

Person Responsible for Follow-up Action

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Recommended Practice

2.7 Drug-allergy interaction checking occurs during the entry of new medication orders and new allergies.[59, 80, 88]
Checklist

Implementation Status

Partially in some areas

Rationale for Practice or Risk Assessment

Interaction checking minimizes the risk of adverse drug events related to allergies.

Suggested Sources of Input

Clinicians, support staff, and/or clinical administration

EHR developer

Examples of Potentially Useful Practices/Scenarios

- Allergy checking occurs for all current medications whenever a new allergy is entered into the system.
- Testing of high risk drug-allergy pair interactions should be done at initial EHR implementation and with periodic EHR upgrades to the medication and allergy database. Specific pairs selected for testing should be those most relevant to the care setting. For example, checking an ACE inhibitor prescription for the allergic reaction of ACE inhibitor-induced angioedema.

Assessment Notes

Follow-up Actions

Person Responsible for Follow-up Action

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Recommended Practice

2.8 Duplicate order checking occurs for high risk medication, diagnostic tests, and procedure orders (excluding "as needed" [PRN] medications).[59, 80, 89]
Checklist

Implementation Status

Partially in some areas

Rationale for Practice or Risk Assessment

Duplicate order checking reduces the risk of inadvertent drug overdoses and unnecessary tests and procedures.[59, 80]

Suggested Sources of Input

Clinicians, support staff, and/or clinical administration

EHR developer

Examples of Potentially Useful Practices/Scenarios

- Therapeutic duplication checking that occurs before new medication orders are submitted (e.g., two orders for the same or two different beta-blockers are placed) is carefully implemented and monitored. Note that there are situations where it is clinically indicated to prescribe duplicate therapies. For example, duplicate alerts should NOT fire for an order for an IV bolus, followed by an order for a continuous drip of the same medication.
- There are rules to determine how and when diagnostic tests or procedures receive duplicate checking before they are ordered.[90]
- Duplicate checking does not include PRN (i.e., as needed) medication orders.
- PRN orders should not include overlapping criteria (e.g., for pain 1-3, give aspirin AND for pain 2-4, give Vicodin).

Assessment Notes

Follow-up Actions

Person Responsible for Follow-up Action

reset page

Recommended Practice

2.9 Drug-condition checking occurs for important interactions between drugs and selected conditions.[59]
Checklist

Implementation Status

Partially in some areas

Rationale for Practice or Risk Assessment

Electronic drug-condition checking reduces the risk of preventable adverse drug events related to specific conditions.

Suggested Sources of Input

Clinicians, support staff, and/or clinical administration

EHR developer

Examples of Potentially Useful Practices/Scenarios

- Drug-condition interaction checking occurs when new medications are ordered or new conditions are identified (e.g., Accutane or tetracycline prescribed for a pregnant woman).

Assessment Notes

Follow-up Actions

Person Responsible for Follow-up Action

reset page

Recommended Practice

2.10 Drug-patient age checking occurs for important age-related medication issues.[15, 91]
Checklist

Implementation Status

Partially in some areas

Rationale for Practice or Risk Assessment

Drug-patient age checking reduces the risk of preventable age-related adverse drug events.

Suggested Sources of Input

Clinicians, support staff, and/or clinical administration

EHR developer

Examples of Potentially Useful Practices/Scenarios

- Drug-patient age interaction checking occurs when new medication orders are submitted for dispensing (e.g., medications contraindicated in the elderly).
- Changes in frequency, dose, or therapeutic substitutions are suggested for pediatric patients.[92]

Assessment Notes

Follow-up Actions

Person Responsible for Follow-up Action

reset page

Recommended Practice

2.11 Dose range checking (e.g., maximum single dose or daily dose) occurs before medication orders are submitted for dispensing.[59, 93]

Checklist

Implementation Status

Partially in some areas

Rationale for Practice or Risk Assessment

Dose range checking reduces the risk of medication overdose.

Suggested Sources of Input

Clinicians, support staff, and/or clinical administration

EHR developer

Examples of Potentially Useful Practices/Scenarios

- Renal dose adjustment suggestions and information on the patient's renal status are clearly displayed prospectively for relevant medications. In cases where actual dose adjustments are not possible within the existing software, EHR developers should provide reference dosing guidelines either within the EHR or through info button links.
- Patient context (e.g., age, renal function) dynamically changes the dosing or administration timing defaults prospectively.
- Maximum single dose and maximum daily dose are independently checked.
- Dose limits are appropriate for age, weight, and body surface area.

Assessment Notes

Follow-up Actions

Person Responsible for Follow-up Action

reset page

Recommended Practice

2.12 A process is in place to review interactions so that only the most significant interaction-related alerts, as determined by the organization, are presented to clinicians.[53, 54]
Checklist

Implementation Status

Partially in some areas

Rationale for Practice or Risk Assessment

Tiered alerting by severity (significance) is associated with higher compliance rates for drug-drug interaction alerts.

Suggested Sources of Input

Clinicians, support staff, and/or clinical administration

EHR developer

Examples of Potentially Useful Practices/Scenarios

- Less significant alerts are presented as information only, rather than as interruptive alerts.[53]
- Alerts that are displayed are modifiable (e.g., show only the most severe interactions versus all interactions) based on feedback from the users and monitoring of user behavior (e.g., alert override rates).

Assessment Notes

Follow-up Actions

Person Responsible for Follow-up Action

reset page

Recommended Practice

2.13 Clinicians are required to re-enter their password, or a unique PIN, to "sign" (authenticate) an order.
Checklist

Implementation Status

Partially in some areas

Rationale for Practice or Risk Assessment

Explicit order authentication reduces the risk of inadvertently entering orders under the wrong identity when someone else is logged in. It gives users an additional opportunity to confirm that the orders they entered are correct, and prevents them from inadvertently signing orders they did not intend to sign.

Assessment Notes

Follow-up Actions

Person Responsible for Follow-up Action

reset page

Suggested Sources of Input

Clinicians, support staff, and/or clinical administration

EHR developer

Examples of Potentially Useful Practices/Scenarios

- An explicit re-authentication process occurs for orders in addition to the original login for access to the EHR.
- Providers should be shown a summary view of orders before signing.

Recommended Practice

2.14 When appropriate, corollary (or consequent) orders are automatically suggested and linked together with the original order such that changes are reflected when the original order is rescheduled, renewed, or discontinued.[94]
Checklist

Implementation Status

Partially in some areas

Rationale for Practice or Risk Assessment

Automatically suggested, linked orders reduce order inconsistencies by managing closely associated orders in tandem.

Suggested Sources of Input

Clinicians, support staff, and/or clinical administration

EHR developer

Examples of Potentially Useful Practices/Scenarios

- Examples include: prothrombin time monitoring when warfarin is prescribed, or drug level measurements with Vancomycin or aminoglycoside orders.[94]
- Corollary orders are deleted whenever the main order is deleted (e.g., if a colonoscopy is cancelled, the bowel prep is also cancelled).

Assessment Notes

Follow-up Actions

Person Responsible for Follow-up Action

reset page

Recommended Practice

2.15 Users can access authoritative clinical reference materials directly from the EHR, including organization-specific information when available.[47, 62, 71, 72, 74, 95]
Checklist

Implementation Status

Partially in some areas

Rationale for Practice or Risk Assessment

Ready access to information can reduce the risk of errors. CDS to improve diagnostic or therapeutic decision making should be accessible in real time at the point of care; otherwise, the advice generated may be useless or underutilized.[59]

Suggested Sources of Input

EHR developer

Health IT support staff

Examples of Potentially Useful Practices/Scenarios

- Relevant reference materials should be accessible through info buttons or similar functionality in the order entry screen/module. Examples include: medication monographs (such as Micromedex), dosing calculators, diagnostic guides, laboratory reference materials, image atlases, anatomical diagrams, patient education materials, and disease-specific treatment guidelines.[96]

Assessment Notes

Follow-up Actions

Person Responsible for Follow-up Action

reset page

Recommended Practice

2.16 CPOE and CDS functionality are tested to ensure proper operation before go-live and with test patients in the production system before clinical use.[97]
Checklist

Implementation Status

Partially in some areas

Rationale for Practice or Risk Assessment

Appropriate testing reduces the risk of errors associated with inappropriate CPOE or CDS system behavior.

Suggested Sources of Input

Clinicians, support staff, and/or clinical administration

EHR developer

Health IT support staff

Examples of Potentially Useful Practices/Scenarios

- A CPOE evaluation tool (e.g., the Leapfrog Group's CPOE "flight simulator" for hospitals) is used to evaluate the safety and effectiveness of CPOE and CDS functionality.[98, 99, 100]
- CDS rules should be tested in the live environment after any CDS-related change and after major EHR software upgrades. This testing should be done for both new rules and existing rules (i.e., regression testing).[101]
- CDS interventions are evaluated to ensure correct firing of alters and reminders.[102]

Assessment Notes

Follow-up Actions

Person Responsible for Follow-up Action

reset page

Recommended Practice

2.17 Questions presented to the user by CPOE or CDS are unambiguous.[57, 59]
Checklist

Implementation Status

Off

Rationale for Practice or Risk Assessment

Misunderstanding queries posed by the system can lead to risks of errors and adverse events.[103]

Suggested Sources of Input

Clinicians, support staff, and/or clinical administration

EHR developer Health IT support staff

Examples of Potentially Useful Practices/Scenarios

- There are policies and procedures to evaluate the clarity of questions posed to users.
- Questions should be kept simple and focused. For example, “Is IV contrast contraindicated?” may be confusing. It might be better to ask, "Is IV contrast safe to administer? Yes, safe. No, not safe."
- Avoid negatively and poorly worded questions (e.g., “Do you want to cancel this alert? Yes, No, Cancel.”).

Assessment Notes

Follow-up Actions

Person Responsible for Follow-up Action

reset page

Recommended Practice

2.18 CPOE and CDS implementation and use are supported by usability testing based on best practices from human factors engineering.[104, 105]
Checklist

Implementation Status

Off

Rationale for Practice or Risk Assessment

Risks of untested usability include decreased clinician efficiency and clinician dissatisfaction, as well as errors and adverse events due to unintended consequences of CDS use.

Suggested Sources of Input

- Clinicians, support staff, and/or clinical administration
- Diagnostic services
- EHR developer
- Health IT support staff
- Pharmacy

Examples of Potentially Useful Practices/Scenarios

- Major CDS and CPOE changes and interventions are tested with representative end users.[104]
- Clinician-reported hazards associated with CPOE and CDS due to poor usability are regularly communicated to a team charged with reviewing complaints and relaying validated hazards to the creator of the CPOE or CDS for management. Regular review and follow-up of validated issues and solutions should occur.

Assessment Notes

Follow-up Actions

Person Responsible for Follow-up Action

reset page

Recommended Practice

2.19 Critical patient information is visible during the order entry process.[106]
Checklist

Implementation Status

Off

Rationale for Practice or Risk Assessment

Ensuring that critical data are visible in the EHR minimizes errors related to misidentification or failing to account for common clinical issues.

Suggested Sources of Input

Clinicians, support staff, and/or clinical administration

EHR developer

Examples of Potentially Useful Practices/Scenarios

- Pertinent clinical information (e.g., age, weight, allergies, pregnancy status, creatinine clearance/GFR) and identifying patient information is easily accessible from the ordering screen (e.g., in a patient header bar, on the ordering screen, from a hide/show panel). If screen resolution allows, it is preferable that the information be accessed without scrolling.[106]

Assessment Notes

Follow-up Actions

Person Responsible for Follow-up Action

reset page

Recommended Practice

2.20 The clinician is informed during the ordering process when additional steps are needed to complete the order being requested.
Checklist

Implementation Status

Off

Rationale for Practice or Risk Assessment

Clinicians may not be aware that an order will not be completed without additional steps, leading to delays in performing the order.

Suggested Sources of Input

Diagnostic services EHR developer

Pharmacy

Examples of Potentially Useful Practices/Scenarios

- Clinicians are informed when non-formulary medications require additional pre-approval.
- Clinicians are informed when “send out” tests require special forms or procedures.
- The mode of informing clinicians or their team members of incomplete orders could include passive notifications (e.g., an informative icon).

Assessment Notes

Follow-up Actions

Person Responsible for Follow-up Action

reset page

Recommended Practice

2.21 Use of abbreviations and acronyms is minimized and standardized.[107,108, 109]
Checklist

Implementation Status

Off

Rationale for Practice or Risk Assessment

Acronyms and abbreviations are a source of errors in both paper and electronic records. Minimizing and standardizing use of acronyms and abbreviations reduces the risk of errors related to misunderstanding.

Suggested Sources of Input

Clinicians, support staff, and/or clinical administration

EHR developer

Examples of Potentially Useful Practices/Scenarios

- Organizational policies on the use of abbreviations and acronyms incorporate, and are consistent with, their use in EHRs.
- Use of abbreviations and acronyms is consistent with industry best practices.
- Abbreviations such as "qd" or "qid" are avoided.

Assessment Notes

Follow-up Actions

Person Responsible for Follow-up Action

reset page

Recommended Practice

2.22 Additional safeguards (e.g., double checking by a second specialist) are implemented in the EHR before high risk medications are prescribed.
Checklist

Implementation Status

Off

Rationale for Practice or Risk Assessment

Medication errors are the most common type of error that reach patients and cause harm. For high risk medications, additional safeguards are justified to reduce the likelihood of harm.

Suggested Sources of Input

Clinicians, support staff, and/or clinical administration

EHR developer

Pharmacy

Examples of Potentially Useful Practices/Scenarios

- A clinician- or specialist-driven process is in place to identify high risk medications that justify additional safeguards and integrate those safeguards into the EHR.
- Chemotherapy agents require special authorization and are displayed in a visually distinct way (e.g., different color, italics).
- "TALLman lettering" is used to reduce CPOE errors from orthographically similar medication names (i.e., look-alike or sound-alike medication names; for example, acetaZOLAMIDE and acetoHEXAMIDE).[110, 111, 112]

Assessment Notes

Follow-up Actions

Person Responsible for Follow-up Action

reset page

Recommended Practice

3.1 Key metrics related to CPOE and CDS (e.g., override rates) are defined, monitored, and acted on to optimize safety and use.[40, 43, 113] *Checklist*

Implementation Status

Off

Rationale for Practice or Risk Assessment

Well-designed and correctly used CPOE and CDS can reduce the most common errors that harm patients. Monitoring and oversight of the performance and clinician use of CPOE and CDS functionality allows optimization of a powerful driver of improved patient safety in an EHR-enabled healthcare system.

Assessment Notes

Follow-up Actions

Person Responsible for Follow-up Action

reset page

Suggested Sources of Input

Clinicians, support staff, and/or clinical administration

EHR developer

Health IT support staff

Examples of Potentially Useful Practices/Scenarios

- Key CPOE and CDS safety indicators are monitored and reported to leadership on a periodic basis. Examples include:
  - Rates of preventable ADEs
  - CPOE use rate
  - Frequency (i.e., volume) of orders that generate an alert
  - Override rate (i.e., percent of alerts that are overridden) in comparison to alert volume
  - Median turnaround time for STAT laboratory or radiology results
  - Percent of all orders requiring modification by someone other than the ordering provider
  - Alerts with the highest percent of overrides (note: these should be evaluated periodically for effectiveness and turned off if deemed unacceptable)
  - Usage of evidence-based order sets
  - Clinician satisfaction with CDS alert functionality
  - Results of any CPOE evaluation tool

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