Free Text as Part of Electronic Health Record Orders: **Context or Concern?**

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Abstract

Background: When placing orders into the electronic health record (EHR), prescribers often use free-text information to complement the order. However, the use of these free-text fields can result in patient safety issues. The objective of our study was to develop a deeper understanding of the conditions under which free-text information, or special instructions, are used in the EHR and the patient safety issues associated with their use, through an analysis of patient safety event (PSE) reports.

Methods: We identified 847 PSE reports submitted to the Pennsylvania Patient Safety Reporting System (PA-PSRS) between January 1, 2021, and December 31, 2022; this dataset was reduced to 677 after controlling for oversampling from particular facilities. After limiting to reports that mentioned the terms "special instructions," "order instructions," "order comments," or "special comments," we analyzed a total of 329 reports. A physician and human factors expert independently reviewed the reports and assigned each a code from the following categories: general care process, medication class, information expressed in the special instruction, special instruction issue, department or staff for which special instruction was intended, and whether the error reached the patient.

Results: Almost three quarters of the special instruction reports were related to Medication (n=233 of 329, 70.8%), followed by Laboratory/Blood Bank (n=54, 16.4%), and Radiology (n=23, 7.0%). Medication classes most frequently associated with special instructions included infectious disease medications (n=51 of 230, 22.2%), antithrombotic/antithrombotic reversal agents (n=32, 13.9%), and nutritional/electrolytes/intravenous fluids (n=32, 13.9%). Nearly one quarter each of medication-related special instructions were about timing (n=58 of 233, 24.9%) and dosing (n=54, 23.2%); most about laboratory/blood bank were related to the site of the blood draw (n=33 of 54, 61.1%), and many involving radiology were related to radiology/echocardiography instructions (n=16 of 23, 69.6%).

The most frequent issues associated with special instructions were containing information contradictory to the order or other information (n=62 of 329, 18.8%); being confusing, incorrect, or used incorrectly (n=58, 17.6%); and not seen (n=25, 7.6%), not viewable (n=11, 3.3%), or instructions absent (n=11, 3.3%). In more than half of the reports, special instructions were intended for nursing staff (n=184 of 329, 55.9%), followed by pharmacy (n=49, 14.9%), radiology (n=21, 6.4%), and laboratory/blood bank (n=20, 6.1%). The error reached the patient in roughly three quarters (n=243 of 329, 73.9%) of the reports reviewed.

Conclusion: Special instructions are frequently used to provide additional context about medication orders and laboratory and radiology procedures and are often intended for nurses and pharmacists. However, these instructions can result in errors and may cause patient harm. Based on our analysis, we provide EHR design strategies and policies and protocols to address patient safety issues associated with free text to enable safer and more resilient care delivery.

Introduction

Electronic health records (EHRs) are central to care delivery, with nearly every healthcare facility in the United States using this technology.[1] EHRs are powerful tools that have digitized medicine and, in many circumstances, have provided a structured format for communicating critical information between different healthcare team members. For example, computerized provider order entry (CPOE) enables prescribers to place medication, laboratory, and radiology orders that can be electronically transmitted to other members of the healthcare team in a consistently structured format which may help reduce variability that can cause patient safety issues.[2,3] CPOE typically contains structured fields in which medication-specific information (e.g., dose, frequency, route) can be entered. Aside from CPOE, there is other EHR functionality that enables structured documentation of allergies, height, and weight. This information then serves to guide a host of services from dietary to medication dosing.

While structured fields bring standardization and consistency to how information is collected, documented, and communicated, they may be insufficient at providing the full context of what is needed for safe and effective care delivery. For example, when placing a medication order, a prescriber may wish to add information to complement the structured order, such as instructing the nurse to give a medication only if a certain condition has been met (e.g., the patient has completed hemodialysis, one hour before a procedure/test is to begin).[4] It is difficult to design EHR interfaces that provide structured fields and information categories for all the different types of information a provider may wish to communicate. For this reason, many EHR functions contain a field that enables free text so providers can communicate additional contextual information. This free-text information is known by various names in clinical practice and the research literature, including special instructions, special comments, order comments, or order instructions.

Patient safety issues have been associated with the use of free text—especially in CPOE systems—due to information that is inconsistent or contradictory with other structured parts of a CPOE order.[5-8] One study showed that 13.5% of all prescriptions with special instructions included discrepancies that could lead to adverse drug events, including underdosing, incorrect route, or ignoring dose escalation or tapering.[9] Special instructions through free-text fields may never be received if different healthcare team member roles have different levels of access to such fields, or if they are not plainly visible in the order.[10,11] Discrepancies between free-text instructions and the order they are associated with could potentially be intercepted by pharmacists at the dispensing stage when pharmacists receive the free-text information. One study found 34.3% of information about how to fill a prescription that was intended for pharmacists could have resulted in patient harm if it were missed by the pharmacist.[12] Another consequence of using free-text to complement orders is when incomplete or unclear instructions about medication usage are given to pharmacy personnel, they may make inaccurate assumptions and delete directions or rewrite them inaccurately without checking back in with the prescriber.[11] However, clarifying the order with the prescriber can cause workflow inefficiencies and delay medication delivery to the patient.[9]

One study looking at medication-related patient safety event (PSE) reports showed that an electronic medication administration display that was confusing, cluttered, or inaccurate resulted in missed special instructions (e.g., note entered by ordering provider for medication to be administered only after dialysis, but special instructions not seen by administering team), which may also contribute to errors when receiving the free-text information.[13] Issues may also arise when special instructions about laboratory orders are entered into a free-text field in the EHR order form but that information does not get transferred to the laboratory information systems interface. This issue can result in delays if laboratory offices have to call the clinician's offices for clarification, missed laboratory orders, tests performed on the wrong date, and a disruption of laboratory workflows.[14]

Developing a deeper understanding of the conditions under which free text is used to complement orders in the EHR may provide an opportunity to optimize EHR interfaces and healthcare facility processes and procedures. For example, the frequent use of free-text comments in prescriptions may suggest a lack of suitable structured functions within the EHR.[5] In this study, we seek to develop a deeper understanding of when free text is used in EHR orders through the analysis of PSE reports. Based on our analysis, we provide EHR design strategies and policies and protocols to address patient safety issues associated with free text to enable safer and more resilient care delivery.

Methods

Data Source and Selection

We analyzed PSE reports submitted to the Pennsylvania Patient Safety Reporting System (PA-PSRS)[a] between January 1, 2021, and December 31, 2022. All nonfederal, acute care facilities in Pennsylvania are required to report PSEs through PA-PSRS. To identify PSE reports that likely referred to safety issues connected to free-text entries and EHR ordering, we searched the free-text event details of the PSE and its other relevant free-text and structured fields with the following keywords: "special instruction(s)," "order instruction(s)," "order comment(s)," and "special comment(s)." Additionally, we expanded the search to allow for up to five words between the first and second words of each (i.e., between "special" or "order" and "instruction[s]" or "comment[s]") to capture a wider array of relevant phrasing. This search resulted in 847 reports; however, 182 (21.5%) reports were submitted by one facility.

To prevent oversampling from one facility, we randomly selected a maximum of 42 reports (5% of total reports retrieved) from each facility. Based on this sampling strategy, a total of 677 reports from 129 facilities were reviewed. Of the 677 reports reviewed, 329 (48.6%) reports were included in our analysis. Reports were included if special instructions, order instructions, order comments, or special comments were mentioned in the PSE report and the special instructions, order instructions, order comments, or

[a]PA-PSRS is a secure, web-based system through which Pennsylvania hospitals, ambulatory surgical facilities, abortion facilities, and birthing centers submit reports of patient safety–related incidents and serious events in accordance with mandatory reporting laws outlined in the Medical Care Availability and Reduction of Error (MCARE) Act (Act 13 of 2002).[15] All reports submitted through PA-PSRS are confidential and no information about individual facilities or providers is made public.

special comments contributed to the safety issue. In some cases, it was not entirely clear whether the use of a term such as "special instructions" in the PSE report (e.g., "staff unaware of special instructions for transport") referred to a free-text comment in the EHR or a more general guideline regarding the need for special handling/treatment; in these situations, we used best judgment to determine whether reports met inclusion criteria.

Coding Taxonomy and Analysis Methods

The PSE fields of "event description" and "event recommendation" were qualitatively analyzed using a grounded theory approach and additional structured report categories were analyzed for further context. Examples of structured report categories included Event Type, Event Subtype, Care Area Type, and Patient Status. Our coding taxonomies were iteratively developed.

Reports that met the inclusion criteria were further reviewed. Each report was assigned a single code for each of the criterion described below:

- General care process: Describes the care process associated with the safety issue (see **Table 1** for definitions of general care processes).
    - Medication class: If the report was categorized into the Medication category, the specific medication that was involved in the special instruction issue was identified either in the free-text description or the required PA-PSRS "medication prescribed" name field. If multiple medications were noted within one report, a primary medication was identified. A clinical expert then classified medications into a medication class (see **Table 2** for medication classes).
- Information expressed in the special instructions: Details about what the ordering provider was attempting to communicate within each general care process category (see **Table 3** for categories of information expressed under general care processes).
- Special instructions issue: Specific type of difficulty in accessing, understanding, or interpreting the special instruction (see **Table 4** for definitions of types of issues).
- Department or staff that received or was supposed to act on the special instruction: The specific healthcare staff (e.g., nurse, pharmacy) or department (e.g., laboratory/blood bank, radiology) for which special instructions were intended (see **Table 5**).
- Reached the patient: The error related to use or absence of required special instructions impacted the patient's care.

Coding Process

A physician and human factors subject matter expert independently reviewed and coded all reports, resulting in each report being dually coded. Discrepancies were discussed until consensus was reached.

Results

Below we describe results for the following categories of the 329 reports included in our analysis: general care process, medication class, information expressed in the special instructions, special instructions issue, who or what department received/was supposed to see or act upon the special instructions, and whether the error reached the patient.

Table 1. Frequency Counts, Percentages, Definitions, and Examples of General Care Process (N=329)

Category	Frequency Count (%)	Definition	Example PSE
Medication	233 (70.8%)	Special instructions were related to medication ordering, pharmacy verification, administration, monitoring, or reconciliation.	Isosorbide mononitrate ER was ordered for oral route. Pill was crushed and given via NG tube despite order instructions stating "DO NOT CRUSH OR CHEW."
Laboratory/ Blood Bank	54 (16.4%)	Special instructions were related to laboratory or blood bank ordering or collecting samples.	COVID swab not being ordered as rapid; however, comments being placed to have test "run as rapid," which creates admission bed assignment delays.
Radiology	23 (7.0%)	Special instructions were related to radiology ordering or conducting of radiological exams.	Reviewed study before performing. Did not note order comments to include additional images. Patient called to return for further imaging.
Other	19 (5.8%)	Special instructions were related to other healthcare processes, such as dietary, infection precaution, and speech language pathology.	Staff member reports that he found an order discrepancy while reviewing infant feeding orders. Part of the order asked for breast milk to be fortified to 24 calories under the "additive" section but had 22 calories written in the "formula concentration with additives" and "special instructions" section. Provider notified and order was corrected to 22 calories.

Note: Details of the PA-PSRS event narratives described in the Example PSE column have been modified for readability and to preserve confidentiality.

General Care Process

About three-quarters of the special instruction reports were related to Medication (n=233 of 329, 70.8%) followed by Laboratory/Blood Bank (n=54, 16.4%), Radiology (n=23, 7.0%), and Other (n=19, 5.8%) (**Table 1**).

Medication Class

All special instruction reports in the Medication general care process explicitly stated the medication involved except three reports (N=230), and these medications were categorized into their respective medication classes. The three most frequent medication classes accounting for more than 10% of reports included infectious disease medications (n=51 of 230, 22.2%), antithrombotic/antithrombotic reversal agents (n=32, 13.9%), and nutritional/electrolytes/intravenous (IV) fluids (n=32, 13.9%). A comprehensive table of all medication classes is displayed in **Table 2** below.

Information Expressed in the Special Instructions

We analyzed information expressed in the special instructions by the general care process. In the general care process of Medication, roughly a quarter of reports reviewed were related to timing (n=58 of 233, 24.9%) and nearly another quarter were related to dosing (n=54, 23.2%). Most of Laboratory/Blood Bank special instructions information was related to confusion caused by special instructions about the catheter or location on the patient's body from which the blood was drawn (site of blood draw, n=33 of 54, 61.1%). Many Radiology issues were related to radiology/echocardiography instructions (n=16 of 23, 69.6%). About half of the Other special instructions information was related to a special diet, feeding, or NPO (i.e., nothing by mouth) status (n=9 of 19, 47.4%). A comprehensive table of special instruction information expressed by the general care process is displayed in **Table 3** below.

Special Instructions Issue

In approximately one-fifth of reports reviewed (n=62 of 329, 18.8%), the special instructions contradicted other information in the order. The second most frequent issue was special instructions being confusing, incorrect, or used incorrectly (n=58, 17.6%), followed by not seen (n=25, 7.6%), not viewable (n=11, 3.3%), and instructions absent (n=11, 3.3%). There was insufficient information to determine the specific special instructions issue in roughly half of the reports reviewed (n=162, 49.2%) (**Table 4**).

Who or What Department Received/Was Supposed to See or Act Upon the Special Instructions

Nursing (n=184 of 329, 55.9%) was the role that most frequently received or was supposed to see or act upon the special instructions, followed by pharmacy (n=49, 14.9%), radiology (n=21, 6.4%), laboratory/blood bank (n=20, 6.1%), and other hospital staff (n=12, 3.6%). There was insufficient information in 43 reports (13.1%) to determine who or what department received or was supposed to see or act upon the special instructions (**Table 5**).

Error Reached the Patient

The error reached the patient in roughly two-thirds (n=243 of 329, 73.9%) of the reports reviewed.

Table 2. Frequency Counts and Percentages of Medication Classes Related to Issues With Special Instructions (N=230)

Category	Frequency Count (%)
Infectious Disease Medications	51 (22.2%)
Antithrombotic/Antithrombotic Reversal Agents	32 (13.9%)
Nutritional/Electrolytes/IV Fluids	32 (13.9%)
Cardiovascular Agents	20 (8.7%)
Antidiabetic Agents	13 (5.7%)
Opioids	12 (5.2%)
Other	11 (4.8%)
Gastrointestinal Medications	10 (4.3%)
Behavioral Health Medications	10 (4.3%)
Systemic Corticosteroids	8 (3.5%)
Hematology/Oncology Medications	7 (3.0%)
Antiseizure Medications	5 (2.2%)
Nonopioid Analgesics	5 (2.2%)
Immunosuppressants	4 (1.7%)
Endocrine Medications	3 (1.3%)
Urology Medications	3 (1.3%)
Neurology Medications	2 (0.9%)
Vaccines	2 (0.9%)

Table 3. Frequency Counts and Percentages of Information Expressed by General Care Process

	Frequency Count (%)
Medication (n=233)	
Timing	58 (of 233, 24.9%)
Dosing	54 (23.2%)
Hold or Administration Parameters	32 (13.7%)
Monitoring Requirements	19 (8.2%)
Misc. Medication Instructions	19 (8.2%)
Do or Do Not Crush or Chew	11 (4.7%)
Rate	9 (3.9%)
Route	9 (3.9%)
Stop Date or Time	8 (3.4%)
Medication Protocol	7 (3.0%)
Discontinue	4 (1.7%)
Medication Compatibility	2 (0.9%)
Do Not Substitute	1 (0.4%)
Laboratory/Blood Bank (n=54)	
Site of Blood Draw	33 (of 54, 61.1%)
Laboratory Instructions	8 (14.8%)
Type of Lab Test	7 (13.0%)
Timing	4 (7.4%)
Number of Units of Blood	2 (3.7%)
Radiology (n=23)	
Radiology/Echocardiography Instructions	16 (of 23, 69.6%)
Timing	4 (17.4%)
Contrast Instructions	3 (13.0%)
Other (n=19)	
Special Diet/Feeding/NPO Status	9 (of 19, 47.4%)
Device Care	2 (10.5%)
Activity Orders	1 (5.3%)
Consult Request	1 (5.3%)
Equipment Detail	1 (5.3%)
Home Health Instructions	1 (5.3%)
Isolation Precautions	1 (5.3%)
Monitoring Requirements	1 (5.3%)
Patient Education	1 (5.3%)
Respiratory Care	1 (5.3%)

Note: Sum of percentages may not equal 100 due to rounding.

Table 4. Frequency Counts, Percentages, Definitions, and Examples of Special Instructions Issues (N=329)

Category	Frequency Count (%)	Definition	Example PSE
Contradictory Information	62 (18.8%)	Special instructions were entered but contradicted the order or other information.	During verification, pharmacist noted that provider ordered hydralazine 10 mg P [orally] BID [twice a day] but noted in special comments section to administer 10 mg once a day on Tuesday, Thursday, Saturday, and Sunday. Pharmacist noted that in the EHR this information would not populate correctly and the order would still populate as BID, causing a medication error. Pharmacist modified the order prior to medication administration.
Confusing, Incorrect, or Incorrect Use	58 (17.6%)	Special instructions were entered but were confusing, incorrect, or used incorrectly, or special instructions were entered and should not have been used.	Doctor entered an order for azithromycin 600 mg x 1 dose for a 3-year-old, 13 kg patient. In order comments, stated "Please give 150 mg PO now, then bottle to go, then take 75 mg PO daily for four additional days." Pharmacists were confused if this meant 600 mg total dose (six additional days of azithromycin after first dose) or standard 5-day dose. Pharmacist called to confirm, and modified order to accurately reflect dose.
Not Seen	25 (7.6%)	Special instructions were entered but were not seen, potentially because of user interface issues.	X-ray of the right knee was ordered. Technician did not notice in the ordering comments that the provider wanted a Rosenberg and patella view of the patient's knee. The patient was notified of need to return to have X-rays repeated. Patient returned two days later to have missing views completed. No harm to patient.
Not Viewable	11 (3.3%)	Special instructions were entered but were not viewable to other staff.	Patient was held overnight to have repeat CTA done at 0200 to rule out PE, but the scan was not completed. Radiology tech explained that entering a time to do an exam does not cross-over to the radiology request. Special instructions must be entered under the comments section for Radiology staff to be aware of the request.
Instructions Absent	11 (3.3%)	Special instructions should have been used but were not entered.	Patient presented to the outpatient radiology location with orders for several X-ray exams, but no specifications as to which views the provider wanted. The technologist called the ordering provider to get the necessary details, that should have been listed in the order comments. The correct exams were completed with no harm to the patient.
Insufficient Information	162 (49.2%)	The report describes general information related to special instruction issues.	Vancomycin trough level ordered as a stat timed for 9/15 at 1400 with special instructions to draw prior to 1500 vancomycin dose. Trough level was drawn at 0921, leading to an inaccurate result and the need to reorder a trough level.

Note: Details of the PA-PSRS event narratives described in the Example PSE column have been modified for readability and to preserve confidentiality. Sum of percentages may not equal 100 due to rounding.

Table 5. Frequency Counts, Percentages, Definitions, and Examples of Who or What Department Received or Was Supposed to See or Act Upon the Special Instructions (N=329)

Category	Frequency Count (%)	Definition	Example PSE
Nursing	184 (55.9%)	Special instructions were supposed to be received, seen, and/or acted upon by nursing.	Patient was ordered Suprep prior to colonoscopy. Doctor had specific orders under special instructions which read "Please give suprep as soon as possible on arrival to the floor. Give 2nd dose 6–8 hours later. Ignore Pharmacy Directions." Nursing followed Pharmacy directions and second bowel prep was not started until morning, which caused a delay in care for the patient.
Pharmacy	49 (14.9%)	Special instructions were supposed to be received, seen, and/or acted upon by pharmacy, including pharmacists, pharmacy technicians, and other pharmacy staff.	Admitting provider ordered Tapazole 10 mg frequency as "daily" with admin instructions of "Takes M,W,F." After calling outpatient pharmacy to confirm dose, verifying pharmacist changed frequency to "User specific - Mon, Wed, Fri." Adding in order comments MWF is not appropriate, as the order would have been verified as daily for nursing to administer.
Radiology	21 (6.4%)	Special instructions were supposed to be received, seen, and/or acted upon by radiology, including radiologists, radiology technicians, and other radiology staff.	AP C-spine view performed but was not requested. Technologist did not see comments under "reason for exam" and under "order comments." Also, "Ordering Comments" area on patient details area of technologist worklist was empty; therefore, no note populated in order comment column on technologist worklist.
Laboratory/ Blood Bank	20 (6.1%)	Special instructions were supposed to be received, seen, and/or acted upon by laboratory/blood bank, including pathologists, laboratory technicians, and other laboratory staff.	A wound culture swab was submitted on an outpatient with the source as "nose." No additional information was provided in the order comments. When the specimen was received into Microbiology, it was canceled as an inappropriate source per protocol but was not investigated prior to canceling.
Other Hospital Staff	12 (3.6%)	Special instructions were supposed to be received, seen, and/or acted upon by other hospital staff, including roles such as dieticians and speech language pathologists.	The patient was ordered a renal pureed diet per speech therapy's recommendations for patient to consume pureed foods. Patient had been receiving regular consistency foods even though "pureed" was included in the diet order. Staff member reviewed the chart again and noticed that the error was within the chart interface to the kitchen. The "puree" indication in the diet order was typed in the free-text special instructions box, which does not interface to the kitchen and therefore was missed. Speech and the resident were notified.
Insufficient Information	43 (13.1%)	The special instructions report does not specify what role or department was supposed to receive, see, and/or act upon the instructions.	Following treatment, Occupational Therapy noted order for splint and sling at all times. This order was entered in the comment section of the device care order instead of the special instructions and so did not flow to the precaution.

Note: Details of the PA-PSRS event narratives described in the Example PSE column have been modified for readability and to preserve confidentiality.

Discussion

Special instructions are frequently used to add context about orders in the EHR but can be associated with patient safety precursor and harm events. We analyzed PSE reports related to special instructions to investigate the types and frequency of medical care processes associated with special instructions, and to understand how their use contributes to patient safety issues. Our analyses provide important insights to guide the use of special instructions and potential redesign of EHR functionality.

Special instructions were most frequently associated with medication orders (specifically dose and timing of the medications) and laboratory orders (specifying the site of blood draws). A recent systematic review found that 9% of pooled patient incidence records about medication errors were associated with harm.[16] Fifty-eight percent of these medication errors occurred at the stage of medication prescribing. Although CPOE can help in reducing some types of medication errors, such errors remain prevalent despite the adoption of electronic prescribing, dispensing, and administration.[17] Further, many studies on medication errors typically analyze the information in structured fields such as dose, time, and route, and potentially do not count the contribution of confusion about information contained in free-text fields such as special instructions to the overall medication error rate. In fact, special instructions are often used as a workaround to give medication directions that are not present in current structured fields on the CPOE.[18-20] This workaround suggests an opportunity to reevaluate the current design of medication and laboratory orders to add fields to specify the context provided by special instructions.

It was noteworthy that the special instructions in almost a fifth of the reports we reviewed contradicted the information contained in other places in the order. This contradiction has also been found in previous literature, contributing to confusion in interpreting special instructions.[21] In addition, special instructions were also associated with other problems, including containing incorrect information and not being viewable or visible, which also supports previous literature about usability challenges of special instructions.[22] Nurses were the intended recipients of over half of the special instructions, followed by pharmacists. Previous research already indicates the importance of physician-nurse communication on timely and accurate administration of the care plan, as well as challenges in using special instructions to communicate many aspects of medications and the care plan.[20,23]

Taken together, these findings suggest that most special instructions may be written by prescribers to alter or supplement the available medication order fields in CPOE and to try to alert nurses and pharmacists to medication administration and dispensing that is different from usual practice. The ubiquitous use of special instructions as a workaround is an indication of a system failure related to communication. Special instructions may also reflect poor usability of CPOE to match clinical workflows, specifically limited capabilities of CPOE to adjust to dynamic changes in the patient's status or medication availability that may ultimately influence medication administration, or challenges that healthcare teams face in communicating with each other about the patient's medications and care plan.[22]

Strategies to Address Special Instruction Patient Safety Issues

There are several strategies that follow from our analysis of PSE reports. These strategies can broadly be described as EHR-based strategies and policy/protocol-based strategies.

EHR-Based Strategies

Assess whether free text could be transitioned into creation of new structured fields: Facilities should routinely investigate the information content of special instructions (e.g., medications, labs, blood tests), and consider adding new structured options to the EHR to integrate this information into the ordering workflow and/or clearly describing standard organizational processes for handling situations in which structured fields do not support ordering.

Determine whether free text should be used if an alternate structured field already exists: The design of EHRs may make it difficult for physicians to find structured fields they intend to use to input specific types of information. Facilities should review the label of existing structured fields to ensure they are easy to understand and find so that structured fields are used as designed.

Simplify ordering interfaces: Some EHRs contain two or more free-text entry fields and the purpose of these fields may be unclear to the ordering provider. Facilities should consider removing unnecessary fields and clearly explaining the purpose of different types of free-text entry fields so providers know which fields to use for what purpose.

Evaluate the entire ordering process: There were several special instruction issues associated with the nurse or pharmacist not seeing the special instructions or the information not being available in their view of the EHR. Facilities should conduct end-to-end usability testing which entails analyzing the workflow of ordering from the point of order entry by the clinician to execution of the order. Each EHR interface involved in this process across all stakeholders should be analyzed to determine whether critical ordering, dispensing, and administration information is appropriately available.

The following principles should be used to guide this type of testing:

- Providers should be able to see which team members will be able to see the special instructions.
- When special instructions are used, there should be an indicator that they are associated with an order.
- Special instructions should be easily accessible and viewable (e.g., on the main screen or within a click).
- The information referenced by the special instructions should be presented concurrently with the special instructions on the screen to avoid memory burden of remembering the details from the instructions.

Policy/Protocol-Based Strategies

Develop shared awareness and expectations for when special instructions should not be used: Facilities should develop protocols regarding conditions for which special instructions should not be used. One example is clinical nuances that require back-and-forth

communication between different members of the healthcare team (e.g., deciding when medications should be administered relative to time of hemodialysis). These protocols should be shared with all members of the care team, especially physicians, nurses, and pharmacists, to ensure shared awareness.

Establish synchronous or near-synchronous communication pathways integrated into the EHR: Facilities should institute protocols to guide communication about when electronic, asynchronous communication should be converted into real-time synchronous or near-synchronous communication. For example, there should be pathways in the EHR to quickly obtain feedback or clarification about unclear special instructions for time-sensitive or high-risk orders.

Establish protocols about details included in distinct free-text fields: There may be instances in which multiple free-text fields are necessary for each order. In cases where the use of multiple free-text fields is warranted, facilities should establish clear protocols about what types of information should be included in each field and ensure that data are distinct from each other. In addition, facilities should also establish protocols about which members of the healthcare team can see which types of special instructions.

Limitations

We examined PSE reports which represent a single data source from one state (Pennsylvania), so results may not be generalizable across other data types or states. In addition, because of the limited descriptive information in the PSE reports, we were unable to understand the larger context of the error reported. In some cases, the special instruction may refer to a certain laboratory or blood bank specimen that needed special treatment (e.g., during transport); however, our analysis did not exclude these cases. Finally, we did not follow up with facilities to gather additional information about each specific report.

Conclusion

Special instructions are often intended for nurses and pharmacists, and are frequently used to provide additional context to guide medication administration and dispensing, as well as laboratory and radiology procedures. However, these instructions can lead to errors because they can be contradictory to the medication order, confusing or incorrect, or not be viewable, and may result in patient harm. Human factors principles can be used to design EHR-based strategies and protocols to improve the safety of special instructions.

Notes

This study was approved by the MedStar Health Research Institute institutional review board.

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