



Spotlight on Electronic Health Record Errors: Errors Related to the Use of Default Values

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ABSTRACT

Hospitals use default values in electronic health record (EHR) systems in a variety of ways (e.g., prepopulating commonly prescribed dosing protocols, coordinating times for therapy delivery or lab draws). Using a keyword query, analysts identified 324 events related to EHR software defaults reported to the Pennsylvania Patient Safety Authority. The three most commonly reported error types were wrong-time errors ($n = 200$), wrong-dose errors ($n = 71$), and inappropriate use of an automated-stopping function ($n = 28$). Many of these reports also indicated a source of the erroneous data ($n = 168$), and the three most commonly reported sources were failure to change a default value ($n = 128$), user-entered values overwritten by the system ($n = 19$), and failure to completely enter information, causing the system to insert information into blank parameters ($n = 16$). Analysts also noted nine reports indicating that a default value needed to be updated to match current clinical practice. Facilities may wish to pay particular attention to the types and sources of error identified in this analysis when considering their use of default values in order sets, including consideration of how users view and enter time information, periodic review and change management, and differentiation between information that is user-entered versus overwritten or populated by the system. (*Pa Patient Saf Advis* 2013 Sep;10[3]:92-5.)

INTRODUCTION

Default values are often used to add standardization and efficiency to hospital information systems like electronic health record (EHR) and computerized provider order entry (CPOE) systems, and they can take many forms. Default values for medication, dose, and route are often found in standardized medication order sets to reduce the likelihood of a medication ordering error for commonly prescribed therapies from which most patients can benefit from a standard therapeutic regimen (e.g., pain control for a healthy patient after surgery). Default values for time are often inserted into medication and lab-draw orders to coordinate staff resources (unless the provider specifies another time such as “now” or “stat”). Automated stopping (auto-stop) values are used to discontinue medications or therapies after a certain amount of time unless a provider renews the order.

Although the use of default values is intended to improve efficiency and standardization, reports submitted to the Pennsylvania Patient Safety Authority indicate that patient harm can occur when a default value is used inappropriately. In an earlier analysis, the Authority investigated events related to the use of EHRs reported through the state’s mandatory reporting system,¹ and errors related to the use of default values were identified as warranting further study.

METHODS

Reports in the Authority’s Pennsylvania Patient Safety Reporting System (PA-PSRS) database include narrative descriptions of the event as well as user-assigned tags for event type (e.g., fall, surgical error) and harm score (ranging in severity from near-miss situations through death). Authority analysts queried the PA-PSRS database using the keyword strings “not activ,” “inactiv,” “default,” “chang,” “setting,” “control,” and “automat.” Search terms were truncated to allow for a “wild card” effect: the query term “inactiv” would return reports containing the terms “inactive,” “inactivated,” “inactivation,” and so on.

The query returned 1,249 reports of events that occurred from June 19, 2004, through February 15, 2013. This data set contained a large number of reports unrelated to the use of default values, and analysts noted that the term “default” had the best specificity. Analysts selected the 487 reports that included the term “default” and manually verified that 324 of these were relevant to this issue. Analysts excluded 163 reports that were not related to default settings in EHR technology; most of these related to inappropriate use of default settings on medical devices such as infusion pumps, defibrillators, and suction regulators.

RESULTS

Classification by Harm Score

Of the 324 verified reports, 314 (97%) were reported as “event, no harm” (i.e., an error did occur, but there was not an adverse outcome for the patient), and 6 (2%) were reported as “unsafe conditions” that did not result in a harmful event. Two reports involved temporary harm to the patient that required treatment or intervention (user-reported harm score E); these events were associated with, respectively, acceptance of a default dose of muscle relaxant (which was higher than the intended dose) and an extra dose of morphine due to acceptance of a default administration time (which was too soon after the patient’s last dose). Two reports involved temporary harm that required initial or prolonged hospitalization (user-reported harm score F).

In the following report, the patient did not receive the ordered antibiotic after a default stop time automatically cancelled the order.

[During the evening, a] patient was ordered [an antibiotic]. The order was entered [30 minutes later] with a 48-hour stop time [default]. The first dose was sent up at that time. The first dose was returned to pharmacy later that evening, and the next two doses were given as scheduled. . . . The order was not renewed, [it] fell off the profile, and no other antibiotics were ordered for the next two days. On [day three], the patient's temperature spiked at 102.3. The physician was called and ordered the [antibiotic] to be continued.

In the following report, the patient did not receive the ordered antidiuretic due to a miscommunication as to which caregiver would administer the medication. The default value in the CPOE system indicated that respiratory therapy was to administer the medication, but this did not match the hospital's clinical practice.

DDAVP [antidiuretic] nasal spray was ordered bid [given twice that same day]. Multiple missed doses were noted on the MAR [medication administration record]. Physician questioned the [registered nurse] caring for the patient about whether the patient was receiving DDAVP as ordered, since sodium levels were increasing despite DDAVP bid and strict free-water restriction. Upon investigation, [it was] noted that five doses were not given. Upon further investigation, [it was discovered that the system] default order has the box checked for "per [respiratory therapy] protocol." . . . Respiratory therapy does not administer this medication, despite the fact that this is the default order selection and the fact that it is listed "per [respiratory therapy] protocol" on the MAR.

Classification by Reported Event Type

Of the 324 identified reports, the most frequently reported event type was medication error (95%, n = 307). These reports were distributed among subclassifications, including wrong time (17%, n = 52), extra dose (16%, n = 51), dose omission (16%, n = 51), and wrong dose/overdose (10%, n = 34). (See the Table.)

Default-Related Failure Modes

Because events related to the use of default values spanned several of the Authority's event types, analysts reviewed the 324 relevant event reports for common threads and categorized the events as follows:

- Time: The default time value did not match the clinician order or the patient's needs (62%, n = 200).
- Dose: The default dose value did not match the clinician order (22%, n = 71).
- Auto-stop: The medication was stopped prematurely when the system's automatic stops were engaged inappropriately (8%, n = 26).
- Route: The default route (e.g., intramuscular, oral, intravenous) did not match the intended route (6%, n = 21).

Two reports were tagged with two event types each (wrong time and route, wrong dose and auto-stop), and eight reports indicated other, scattered problems with default values unrelated to medication process, such as a default printer setting sending a label to the wrong location, default "normal" lab result entry, default protocols (e.g., insulin, respiratory therapy) that were inappropriate for the

Table. Classification by Reported Event Type

EVENT TYPE	NO. OF REPORTS
Medication error	307
Dose omission	51
Extra dose	52
Wrong	147
Dose/overdosage	34
Dose/underdosage	10
Drug	2
Dosage form	2
Duration	7
Rate (intravenous)	2
Route	18
Strength/concentration	5
Technique	4
Time	62
Patient	1
Prescription/refill delayed	6
Medication list incorrect	9
Monitoring error (includes contraindicated drugs)	1
Unauthorized drug	2
Other (specify)	39
Error related to procedure, treatment, or test	16
Other/miscellaneous	1
Total	324



patient, or records filed under a default physician.

Analysts also investigated the reported origin of error, which was relevant and available in 168 reports.

Problems originating in the use of EHRs

- Failure to change a default value (40%, n = 128). Reports explicitly mentioned that a user forgot to change a default value.

Pharmacist did not change the default [dose] of the medication when entering into computer system.

- Failure to enter a complete order, resulting in the inappropriate use of a default (5%, n = 16). Reports explicitly mentioned that a user entered an order that was missing certain order parameters and these order parameters were later filled in with default values.

Physician entered order into [the CPOE] but did not include the number of tablets. Without all of the information, the number of tablets ordered through [the CPOE] went to a default number in excess of what the pharmacy would send. Physician had to rewrite the prescription and resend it to the pharmacy. The result was that the patient did not receive four doses.

Problems originating in the design of EHRs

- User entry overwritten by the system in favor of a default value (6%, n = 19). Reports explicitly mentioned that a user had entered a value that was then overwritten by the system and replaced with a default value.

Doctor ordered [early] calcium level. Lab was entered to be picked up at [early time] but defaulted to [morning] lab draw. Doctor entered the patient's room at [later time] to assess the patient and found the lab tech was just drawing the blood.

- Inability to change a default value (2%, n = 5). Reports explicitly mentioned that a user was trying to enter a value other than the default but was unable to do so.

Order placed for digoxin 0.25 mg Q6h [every six hours], first dose stat, at [midafternoon]. The order set for digoxin load did not allow orderer to place a stat order, and the first dose defaulted to [over five hours later]. Since the stat dose was omitted, that order was discontinued.

In addition to considering the stated cause and result of the event, analysts also identified nine reports that explicitly stated that the default needed updating because it did not match current clinical practice, indicating that the problem originated with the implementation of the EHR system.

DISCUSSION

Health information technology systems such as CPOE can be important tools in reducing drug-related injury and harm, especially if installed systems are refined and tailored to match clinical practice.² Tailoring CPOE systems to clinical practice can also benefit clinicians, as disease-specific and care-specific order sets can help improve acceptance and adoption over more generic order sets.^{3,4} However, literature suggests that (1) the default values used in order sets and clinical decision support must match a particular care area's clinical practice in order to be helpful and (2) facilities should be wary of wholesale acceptance of default values supplied by the EHR supplier.⁵ To make best use of safety resources, facilities may wish to concentrate on developing and refining a more limited set of order sets that cover the highest-usage and highest-risk clinical pathways.⁶

After development and validation, facilities can plan for the ongoing maintenance of order sets. A study of 511 chemotherapy order sets conducted by US Oncology found that 51 were recommended for removal or consolidation.

Of the remaining 460 regimen order sets, all had at least some changes recommended: 75% had title changes, 14% had cycle-related changes, 31% had reference updates, and 13% had dosing updates.⁷

CONCLUSION

Overall, 324 events were identified that described problems related to default values in EHR software. Reports of wrong-time errors were the most prevalent, followed by wrong-dose errors, inappropriate use of auto-stops, and wrong-route errors. When available, the cause of the error was assessed as well; failure to change a default value was reported most frequently, followed by user entries overwritten by the system, default values inserted into incomplete orders, and inability to change a default value. Analysts also noted that several reports indicated that a default value needed to be updated to match clinical practice.

The event narratives analyzed in this report suggest three commonly reported error types that may warrant closer attention:

1. Wrong-time errors. To address wrong-time errors, facilities can pay particular attention to the manner by which time information is entered by users and the manner in which time information is relayed to users after selection. This can include assessing how and whether a user can specify times for particular types of orders (e.g., medications, lab draws); implementing user training to ensure that users know the difference between selecting “stat” or “now,” selecting a specific time, and accepting the next standard time for the administration or procedure; and ensuring that, after selection, the system clearly displays the selected time (e.g., “This dose will be given in the next general medication round at 0800 tomorrow.”).

2. Errors related to outdated values. To address errors related to situations in which default values have not kept up with changes in clinical practice, facilities can develop EHR system maintenance policies that require periodic assessment of whether order

sets and clinical decisions support current clinical practice,⁸ as well as change management procedures for updating these systems once gaps are identified.^{9,10}

3. Errors related to system-entered information. To address these errors

(whether default values are written over user-entered information or inserted into incomplete entries), facilities can determine whether EHR software allows users to easily differentiate between user-entered data and system-entered data.

NOTES

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