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Finding Fault With the Default Alert

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The Case

A 33-year-old man with known refractory epilepsy and developmental delay was admitted to the hospital after experiencing increased seizures. He previously had been well managed with levetiracetam (Keppra); however, therapy had been discontinued after the patient experienced a new rash. Once admitted to the hospital, his seizures were controlled with fosphenytoin. Discharged 2 days later, the outpatient plan was to begin phenytoin 500 mg once daily. However, the discharge prescription was erroneously written as phenytoin 500 mg "three times daily" (TID). His outpatient pharmacy filled this prescription and the patient subsequently took the medication at this frequency for 2 days. After noting the patient's difficulty in walking, his mother contacted the primary team, the error was identified, and the frequency of dosing corrected to "once daily."

In review of the resident's discharge note, the discharge plan for the phenytoin was clearly stated, i.e., "once daily." However the resident was relatively unfamiliar with the electronic medical record (EMR) and failed to notice that the EMR default frequency for phenytoin was "TID." While the error may be attributed to a "slip" by a busy resident who was unfamiliar with the computer ordering system, alert fatigue also played a role. When a phenytoin dose much greater than normal is prescribed, the EMR triggers an alert for the clinician; this alert was overridden by the resident. Furthermore, it is likely that the hospital pharmacy similarly missed or overrode a dosing alert. Lastly, the community pharmacy did not question the 500 mg TID dosing regimen. Although the patient was inadvertently prescribed excessive phenytoin and experienced temporary toxicity, he experienced only temporary harm. As a result of this error, the hospital changed its default setting for phenytoin from TID to once daily.

The Commentary

Computerized alerts embedded into electronic medical record (EMRs) and computerized provider order entry (CPOE) systems are triggered at the point of prescribing and are designed to warn clinicians about potential physician order errors associated with, for example, allergies, inappropriate dosing, and significant drug–drug interactions. Most studies evaluating the impact of alerts on prescribing behavior demonstrate

benefit.(1) However, physicians override computerized alerts up to 95% of the time.(2-4) Associated with excessive alerts, "alert fatigue" has been identified as the prime reason for alert override.(4)

The current case clearly demonstrates perhaps the most worrisome consequence of alert fatigue—physicians who have become desensitized to alerts, such that they ignore most of them, even those that warn of critical safety events. Alert fatigue affects most physicians in nearly all organizations. To minimize alert fatigue, alerts must be both sensitive and specific. This would ensure physicians are warned of all potential errors but not presented with irrelevant and redundant material. In studies assessing alert specificity and sensitivity, while most alerts were valid, many were considered to be clinically irrelevant.(3,5) Consequently, physicians' decisions to override alerts are often entirely appropriate. In general, specificity of alerts is likely jeopardized by high sensitivity.(5,6)

Strategies to Reduce Alert Fatigue

To ensure that computerized alerts remain relevant and effective, ongoing monitoring of triggered alerts and the associated physician responses is required.(7) In addition, a qualitative evaluation of alerts is recommended. As evidence, it was only after we directly observed and interviewed prescribers in our study that we determined that physicians receiving alerts were often not the ones who were responsible for deciding to prescribe the medication in question. Nor did alerts trigger subsequent discussions between attending and resident physicians.(8)

Several strategies, with varying levels of supportive evidence, have been proposed to target alert fatigue:

i. Increase alert specificity. Examples of ways to increase specificity include classifying medications as individual agents (rather than by classes of medication) and specifying the route of administration.
ii. Tier alerts according to severity. Presenting each alert level in a different way to users (e.g., different colors, different signal words) allows prescribers to identify important alerts quickly and may result in fewer important alerts being missed or overridden. This approach, although intuitive, is problematic due to the lack of widespread agreement regarding what constitutes a high-level or low-level alert.
iii. Include only high-level (severe) alerts in an alert set. Low priority alerts have been shown to cause user frustration and slow down the medication ordering process. Low priority information could be presented in a non-interruptive way (e.g., as a hyperlink on the prescribing screen).
iv. Apply human factors principles when designing alerts (e.g., format, content, legibility, and color of alerts).
v. Tailor alerts to patient characteristics. As an example, integrate laboratory results into the alert system to ensure alerts are more patient-relevant. Other strategies include presenting pregnancy alerts only for patients who are pregnant, not all female patients in the hospital, and only presenting allergy alerts for patients in whom a complete list of allergies has been documented.
vi. Customize alerts for physicians. Presenting specific alert types to specific specialties or skill levels would ensure that specialists with a high level of knowledge in an area do not receive alerts related to that area (e.g., nephrologists may not need to receive alerts about nephrotoxic drugs). This approach is sometimes viewed as problematic because computerized alerts are meant to serve as a safety net in times of forgetfulness or time pressure, even for experts.

Rather than implementing the entire suite of alerts available in an EMR/CPOE initially, a more sensible approach is to include a few alert types and provide alternative forms of decision support to prescribers (e.g., pre-written orders). The reason for this specific recommendation is that following the discovery that too many alerts are being triggered in a system, it is difficult to decide which alerts to remove.(9,10)

CPOE Default Settings

In addition to alert fatigue, this medication error case highlighted the problem of CPOE default settings. Inappropriate default values populating a screen have been described as "usability problems" and the failure of users to notice and change the inappropriate default settings termed as "technology induced errors."(11) We sought to identify the rates of system-related errors (errors where design of the electronic system contributed to the error) associated with the use of two commercial electronic prescribing systems. We found that a significant proportion of system-related errors resulted from physicians failing to change incorrect default times of administration.(12) This error occurred at a rate of 17 errors per 100 admissions in one electronic system and 3 per 100 admissions in another system. Although default times increase efficiency of prescribing in some cases, they require prescribers to consider whether a default setting must be changed, an extra cognitive task creating a new opportunity for error.(12)

Take-Home Points

- Alert fatigue is a significant problem for most hospitals with alerts embedded in EMR/CPOE. A consequence of alert fatigue is physician desensitization to alert presentation so that most alerts are ignored, even those that warn of critical safety events.
- To reduce alert fatigue, several strategies have been suggested, with varying levels of supporting evidence (e.g., tiered alerts, alerts tailored to patient and provider characteristics).
- Rather than implementing the entire suite of alerts available in an EMR/CPOE initially, a more sensible approach is to include a few alert types and provide alternative forms of decision support to prescribers.
- Although default times in CPOE may increase efficiency of prescribing in some cases, their value is questionable because prescribers must consider whether a default setting must be changed, an extra cognitive task creating a new opportunity for error.

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