

Brave new world

Computerized medical records pose some very real pitfalls

By all accounts, electronic records are transforming health care in this country. The federal government and manufacturers of records systems promise increased patient safety and decreased costs with the implementation of electronic health records (EHRs). But not everyone is convinced.

According to the Office of the National Coordinator for Health Information Technology (ONC), an EHR is a digital version of a patient's paper chart capable of being shared with other providers across more than one organization. EHRs are built to share information among various health-care providers and organizations, including physicians' offices, hospitals, medical-imaging facilities and laboratories.

EHRs, according to ONC, don't just contain health information, they "compute" or manipulate information in ways that make a difference in health outcomes. One of the ways in which EHRs manipulate information is in the aggregation, analysis and communication of patient information such as laboratory results. Gathering all relevant lab results and organizing them in handy graphical interfaces to depict not only individual results but also trends in those results can't help but improve patient care.

Or can it?

According to a study published in the *Journal of the American Medical Informatics Association* titled "Graphical Display of Diagnostic Test Results in Electronic Health Records: A Comparison of 8 Systems," many current EHR-generated graphical depictions of laboratory results do not meet evidence-based criteria for laboratory data comprehension.

According to the study, the accurate interpretation and display of clinical laboratory results is "essential for safe and effective diagnosis and treatment." As EHRs become more common, more physicians will rely on software-generated displays of laboratory data to produce "clear and accurate synthesis of data over time." Confusing, inaccurate or suboptimal displays can thus have significant and negative effects on patient safety.

In order to determine how well currently available EHRs accomplish these functions, the study's authors evaluated the graphical displays of clinical laboratory results in eight EHRs using "objective criteria for optimal graphs" based on medical literature and expert opinion.

The eight systems reviewed included six EHRs certified by the ONC, one prototype EHR and the Veterans Affairs Computerized Patient Record System. The authors developed 11 objective criteria to evaluate and compare the performance of the EHRs. All of the criteria were designed to test conformity with "widely accepted principles of good data presentation."



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The criteria ranged from the simple (whether patient-identifying information was clearly displayed on a graph) to the vitally important (whether a user can view, hover over or click on a data point to see the precise value). The study revealed, however, that none of the EHR graphs studied met all 11 performance criteria, and one-third met only five criteria.

No graph contained a y-axis label that displayed both the name of the measured variable and the unit of measure. Lab results that require the user to look elsewhere for information important to the interpretation of the results defeat the purpose of an EHR. One system plotted data in "reverse chronological order" with the most recent results on the left side of the graph. This seemingly arbitrary depiction could be "particularly confusing" to users.

In addition, in only two EHR systems could a user hover over or click on a plotted data point to view the precise result. Most disturbingly, one system depicted data collected at unevenly spaced times using evenly spaced data points which, according to the authors, "had the effect of erroneously depicting the visual slope perception between data points." As the study dryly concludes, this deficiency could have a "significant, negative impact on patient safety."

The accurate display and interpretation of laboratory results is the *raison d'être* of a laboratory report, paper or electronic. EHRs have the potential advantage of generating graphical depictions of "important diagnostic clues" such as rising creatinine levels in a patient with renal failure or the downward trend of hemoglobin in a patient with a gastrointestinal bleed.

A poorly designed graph, however, can be deceptive, misleading and downright dangerous. The whole point of a graph is to provide physicians with an analytical shortcut. If the production of that shortcut, however, creates inaccuracy or the tendency to mislead, then the EHR software itself is a threat to patient safety.

In light of their findings, the study's authors urge policymakers and regulators to ensure that EHRs produce clear and accurate displays of clinical laboratory results by tightening certification standards. The authors also argue the need to warn "front-line providers" that reliance on graphical displays of lab results could be hazardous to their patients' health.

Increasingly, lawyers who represent injured patients will be inspecting not only the contents of a patient's EHR but also its organization. Where the very software in an EHR program can lead to error and injury, the EHR manufacturer could very well become a viable defendant or third-party defendant. ■

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