Catalyzing Pediatric Electronic Health Record Usability and Safety Improvements

Naveen Muthu, MD,a,b Raj M. Ratwani, PhDc,d

Nearly every office-based pediatrician now uses an electronic health record (EHR).1 There is now evidence that using EHRs can improve guideline adherence, reduce medication errors, and improve other measures of health care quality,2 but the rapid adoption of EHRs has also precipitated unintended and undesired consequences, including the poor usability of EHRs.3 Usability is the extent to which a technology can be used efficiently, effectively, and satisfactorily.3 Poor EHR usability results in clinician frustration, contributes to clinician burnout, and has direct patient safety consequences.5–7 To improve EHR usability, we need rigorous and robust measures of usability to identify specific problem areas, quantify the effect of improvement efforts, and facilitate product comparisons so that consumers can purchase products that meet their needs. In this issue of Pediatrics, Overhage and Johnson8 report on a large-scale analysis of Cerner Millennium EHR use in >20 million pediatric ambulatory encounters by almost 30,000 physicians. Their approach provides a broad assessment of the time spent on tasks in the EHR, and time on task is a usability measure commonly used to assess efficiency. Physicians spent an average of 16 minutes on the EHR per encounter, with most of their time on chart review and documentation, followed by ordering. This is generally consistent with survey-based estimates of office-based pediatrician EHR use.1 Historically, research and policy has been focused on EHR usability primarily in adult settings. Although, in seminal studies in pediatrics, researchers identified harms from poorly designed and implemented EHRs and recommendations exist to improve the pediatric functionality of EHRs, the optimization of EHRs for pediatric settings is lagging.9,10

Pediatric care has not seen the same reduction in medication errors from computerized physician order entry as adult care.11 Only recently did the Office of the National Coordinator for Health Information Technology, the federal agency that oversees EHRs, release 10 pediatric-focused recommendations for the voluntary certification of health information technology.12 We are delighted to see Overhage and Johnson’s8 focus on measuring time on different tasks is important for understanding EHR efficiency, but it should not be mistakenly treated as a comprehensive measure of usability because it misses important aspects, such as cognitive effort and workload. For example, in multiple studies, researchers have found that EHR implementations were followed by an increase in physician task switching, even when the overall time spent on individual tasks remained the same.13,14 Rapid task switching can be an important contributor to cognitive burden and...
Furthermore, the functional components of the EHR are not necessarily aligned with the cognitive tasks of the physician. For example, Overhage and Johnson\textsuperscript{9} describe the messaging function of the EHR as a proxy for care coordination. However, in studies linking message inbox volume with physician burnout, researchers have noted that not all messages provide the same level of value in the care-coordination task.\textsuperscript{16,17} Time spent on such low-value functional tasks are also potential sources of frustration and burnout. Finally, although Overhage and Johnson\textsuperscript{9} were able to measure EHR use across multiple specialties in ambulatory care, the specialties used the same EHR vendor, and it remains a challenge to use the same measures of time on EHR tasks across different EHR vendors and care settings. In other efforts focused on EHR audit logs, researchers aim to synchronize these data across EHRs, improving the generalizability of this work.\textsuperscript{18}

More complete yet scalable measures for EHR usability need to be developed beyond measuring time spent on tasks.

The Overhage and Johnson\textsuperscript{9} study also has important implications for efforts to increase transparency around EHR usability and system performance. The 21st Century Cures Act, passed in 2016, called for the creation of a much needed EHR reporting program that would provide comparable measures of EHR usability across different EHR vendor products implemented in health care facilities used in the United States.\textsuperscript{19} Quantitative measures of time on task, in addition to other measures of cognitive effort, are critically important measures that should be part of the reporting program.

Overhage and Johnson\textsuperscript{9} demonstrate that EHR vendors are able to provide these time-based measures across health care facilities. These types of measures, provided by EHR vendors for each specific health care facility, should be a central part of the EHR reporting program for both adult and pediatric medicine.

The adoption of EHRs over the last decade has allowed for tremendous improvements in pediatric care delivery, including electronic prescribing, automated plotting of growth charts, and support for the appropriate delivery of immunizations and well-child care.\textsuperscript{1} Our hope is that this study serves as a catalyst for a focus in the next decade on pediatric EHR usability and safety, not only demonstrating the gains in health care quality seen in adult settings but also, helping mitigate patient harm and the provider burnout crisis.

### ABBREVIATION

EHR: electronic health record

### REFERENCES


10. Lehmann CU; Council on Clinical Information Technology. Pediatric aspects of inpatient health information technology systems. \textit{Pediatrics}. 2015;135(3). Available at: www.pediatrics.org/cgi/content/full/113/2/e756


13. Benda NC, Meadors ML, Hettinger AZ, Ratwani RM. Emergency physician task switching increases with the introduction of a commercial electronic...


Catalyzing Pediatric Electronic Health Record Usability and Safety Improvements
Naveen Muthu and Raj M. Ratwani
Pediatrics 2020;146;
DOI: 10.1542/peds.2020-030965 originally published online November 2, 2020;

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://pediatrics.aappublications.org/content/146/6/e2020030965