

Electronic health records–Applications for the allergist/immunologist: All that glitters is not gold

Lawrence D. Frenkel, M.D.

ABSTRACT

A review of existing literature on electronic health records (EHR) demonstrates the lack of a comprehensive analysis of the current status of, and impediments for, physicians, including allergists/immunologists, to adopting a fully functioning system. For physicians to logically embrace the use of EHRs, a comprehensive but straightforward presentation of this complex subject would be helpful. In fact, although there is some evaluative information regarding data derived from EHRs about asthma epidemiology and practice guidelines as well as recording adverse allergic reactions, it is impossible to find one scholarly article that evaluated the use of fully functional EHRs from the perspective of an allergist or immunologist. This analysis presents a review of the background and goals of EHRs and describes the major problems that delayed their widespread acceptance. Necessary solutions to the problems are presented in this article. The potential benefits of better EHRs could foster widespread acceptance and use of these systems.

(Allergy Asthma Proc 37:273–278, 2016; doi: 10.2500/aap.2016.37.3959)

Somehow, the conviction that electronic health records (EHR) (also called electronic medical records) will solve systemic problems in health care delivery in the United States has been embraced at the highest levels of government.^{1–3} There certainly is no argument that having a standardized, longitudinal, accurate, complete, legible, and user-friendly data base with information that is accessible to all health care providers who interact with each patient would be a major benefit to the health care system and to patients. The proposed goals for EHRs are the following: (a) increased patient safety and fewer medical errors; (b) enhanced, rapid, and effective communication of patient data among all members of the health care team, also known as interoperability; (c) reduced costs; and (d) improved quality of patient care through completeness and organization of longitudinally obtained patient data.⁴

One example of the potential benefits of a well-functioning EHR is if it facilitates the ability of immunization registries to increase immunization rates and prevent overimmunization across all age groups. In fact, some states have mandated that all health care providers who see children must transmit immunization data to these registries, although enforcement of such mandates for preschool and school attendees varies widely.^{5,6}

Despite the potential benefits of EHRs, health care providers have been slow to adopt them^{7–10} or even downright hostile about their deficiencies.^{11,12} The most recent data from a 2014 survey cosponsored by the American Medical Association,¹³ indicates that physician satisfaction with the concept of EHRs is 34%, down from 62% four years previously and that 54% of physicians are unhappy with their own EHR systems. In a 2012 American Academy of Pediatrics survey, although 79% of pediatricians claimed to be using an EHR, only 14% had a “fully functional” system.¹⁴ Other data are even more problematic, with participation in the meaningful use subsidy program at only 20% nationally and 10% among New Jersey pediatricians (New Jersey participation is the worst in the nation).¹⁵ In Rhode Island, a survey of all licensed physicians, repeated annually between 2009 and 2013, indicated that, by 2013, 81% used EHRs but 58% reported that they did not improve job satisfaction, and half were “equivocal” on whether they improved workflow or patient care.¹⁶

To promote the widespread adoption and use of EHRs and other health information technology, Congress passed the \$35 billion Health Information Technology for Economic and Clinical Health (HITECH) Act as part of the American Recovery and Reinvestment Act of 2009.^{2,17,19} This legislation aimed to improve the quality, safety, and efficiency of the U.S. health care system, and one of its overarching goals is to achieve the “meaningful use” of health information technology.^{7,17,18} The HITECH Act provisions include incentive payment programs and technical assistance through regionalized structures for eligible health care professionals and hospitals to adopt, implement, or upgrade certified, interoperable, multifunction EHR

From the Departments of Pediatrics and Microbiology, University of Illinois at Rockford, Rockford, Illinois

The author has no conflicts of interest to declare pertaining to this article

No external funding sources reported

Address correspondence to Lawrence D. Frenkel, M.D., University of Illinois College of Medicine, 1601 Parkview Avenue, Rockford, IL 61107

E-mail address: lfrenkel@uic.edu

Copyright © 2016, OceanSide Publications, Inc., U.S.A.

Table 1 Attributes of an optimal EHR

Topic Area	Examples of Content
History and physical	Display original and follow-up clinical history and physical examination data in a structured format
Demography	Detailed description of size and characteristics of clinic population
Display time-trended data graphically	Growth parameters, BP
List allergies	To foods, medications, or vaccines
List medications and alerts	Current and historic
Order entry	Entry of orders for laboratory, radiologic, pharmaceutical, and ancillary consultative services
Results of laboratory and ancillary test (graphically as appropriate)	Abnormal test result alerts
List diagnoses	Current and historic
Disease prevention	Sharing preventive health reminders,
Disease management support	Provision of decision support, guidelines, practice parameters (e.g., from ACAAI/AAAAI)

EHR = *electronic health record*; BP = *blood pressure*; ACAAI = *American College of Allergy, Asthma, and Immunology*; AAAAI = *American Academy of Allergy, Asthma, and Immunology*.

systems.⁸ However, along with the HITECH, meaningful use funding came with additional regulations directed toward providers who care for patients covered by Medicare and Medicaid.^{7,19}

What Are the Attributes of an Optimally Functional EHR?

Shown in Table 1 is a list of attributes of an optimal EHR. A completely functional EHR should be able to do the following (adapted from Lakbala and Dindarloo⁹): (1) display original and follow-up clinical history and physical examination data in a structured format; (2) display demographic data; (3) display time-trended data graphically; (4) display allergies; (5) list medications, current and historic; (6) provide order entry of laboratory, radiology, pharmacy, and ancillary services, and medication alerts, and interactions; (7) report results of these listed tests and alerts as appropriate; (8) display diagnoses; (9) offer preventive health reminders; and (10) provide decision support, e.g., guidelines, clinical pathways.

What Is the Role of the Federal Government in Promotion of EHRs and What Incentives Are Provided?

Initially, the federal government funded subsidies, up to \$148,940 over a 5-year period, for health care providers who established and “meaningfully” used certified, interoperable, and secure EHR systems.²⁰ The Centers for Medicare and Medicaid Systems and the Office of the National Coordinator for Health Information Technology have established standards and other criteria for structured data that certified EHRs must

meet. Interoperability means that data retain exactly the same meaning no matter which system they are accessed through and that data are available to all of a patient’s authorized care providers. The ability to appropriately share patient data through a secure network can be the key to cost saving, in part, by eliminating redundant repeated testing and procedures.^{21,22} “Secure” is defined by the federal Health Insurance Portability and Accountability Act of 1996 and HITECH legislation,² which were designed to support efforts to improve patient safety and care while ensuring privacy.^{2,23} The requirements for proof of meaningful use are defined by the federal government in a list of patient care measures to which a provider must attest annually. EHR and interface vendors now seem more concerned about competition with other vendors^{1,11} and certification by the federal government than with the quality of their products *vis-à-vis* interoperability and fostering the quality of patient care.²⁴

The federal requirements for the first year, or stage 1, were minimally demanding,¹³ and those for stages 2 and 3 are much more stringent. The stage 3 requirements include complex objectives and reporting on clinical quality measures to achieve meaningful use.²⁵ Incentives and penalties (Medicare payment reductions) are based on provider attestations to patient care measures, including the use of EHRs.¹⁸ Indeed, in 2015, penalties, which range from 1% to 5% of their Medicare reimbursements, for not using EHRs may be instituted.²⁶ Pediatric practitioners’ participation in the incentive program is obstructed by more stringent requirements than adult providers specifically regarding Medicaid patients.^{4,20} The issue of Medicaid EHR

Table 2 Barriers to successful implementation of a successful EHR

Barrier	Examples
Lack of proven merit	Lack of perceived and documented EHR benefit to patient care destroys the credibility of efforts toward adopting this technology
Mismatch between regulations and technology	A conviction that the regulations concerning meaningful use do not match the current level of technology and do not address important issues of design, usability, and malfunction
Limited interoperability	Lack of effective information sharing
Inadequacy of software programs	Software programs are not designed for pediatric patients and other specialist-oriented data bases
Costs	High initial and maintenance costs for hardware, software, and personnel
Decreased workflow	Too much time and effort needed to enter and review entered data with inefficient systems
EHR distracts from effective communication	Creates physical and emotional barriers between the physician and the patient

EHR = electronic health record.

regulations affects both inpatient and outpatient providers.²⁷

What Are Some of the Barriers to the Implementation of EHRs?

In the efforts to universally implement fully functional EHRs in the United States, several impediments, listed in Table 2, have neither been adequately recognized nor resolved^{1,4,11,25,27}:

1. The lack of proven merit, *i.e.*, lack of perceived and documented benefit to patient care afforded by an EMR destroys the credibility of efforts toward enthusiastically adopting this technology.^{2,7,11,28}
2. The conviction that the regulations concerning meaningful use do not match the current level of technology as supported by available interfaces and vendors.¹ In addition, regulations do not address important issues of design, usability, and malfunction.^{11,21}
3. The issue of limited interoperability, *i.e.*, the lack of ability of health information systems to work together within and across organizational boundaries to advance the effective delivery of health care for individuals and communities, is a pervasive problem²¹ and was one of the initial reasons for EHR development.¹ Many physicians perceive that part of the problem is due to the single-minded profit orientation of EHR vendors^{1,24} and the competitive nature of large hospitals and health care organizations for medical “business” that leads to patient records being “held hostage.”²⁴
4. The inadequacy of software programs designed for pediatric patients and other specialist-oriented data bases, including software directed at data of interest to allergists and immunologists, is an ongoing frustration, in part, because the initial development was done

by information technology professionals without adequate input by physicians.^{4,11,25} It is true that most EHRs include a list of “allergies” as perceived by the patient but there are documented concerns about the validity of these data.^{29–31} Even more concerning is the propensity of overworked clinicians to “override” allergy alerts from the EMR³²! There is general consensus that part of the explanation for this behavior is that EHRs are often poorly designed for clinical applications.⁸ In addition, the old adage of “garbage in, garbage out” remains true. Variation in the accuracy of EHR data threatens the very acceptance and use of EHRs.³³

5. The initial hardware and software costs entailed in purchasing the EHR system and subsequent maintenance costs (usually borne by the increasingly financially stressed providers) are a significant issue.¹³
6. The time required, especially by physicians, for selecting this is the proverbial unfunded government mandate.
7. The effort and time required to obtain accurate and complete data (as required by regulations and not necessarily important for patient care) on each patient at the time of each interaction, is associated with a decrease in workflow and productivity.^{2,7,10,13}
8. Barriers created between the physician and the patient by the distracting emphasis on templated data entry into the computer (checking the boxes), sometimes hinders the ability to obtain crucial, even lifesaving, patient data, *e.g.*, travel to Ebola endemic areas.^{7,22,27}
9. Importantly, the current templated data entry ignores the nonverbal cues and progression from one question to another that a physician uses to develop a diagnosis.^{4,27}

Table 3 Solutions for improving EHR systems for the allergist/immunologist

Topic Area	Solution
Cost effective and fully functional EHR systems	Demand quality, user-friendly, and low-cost EHR systems from vendors who are publicly evaluated by government agencies
Proof of EHR benefit in terms of patient care quality and safety	Foster evidence-based studies of pertinent patient outcomes and care parameters, <i>e.g.</i> , asthma clinical pathways
User-friendly EHR systems	Get involved with improving specialty-oriented hardware and software
Improve data entry and quality and, in turn, workflow	Develop user-friendly, appropriate, and quality templates for data entry by patients, scribes, and providers
Improve interoperability	Demand that government enforces interoperability mandates
Maximize patient data security	Support development of effective patient data encryption and protective legislation

EHR = *electronic health record*.

10. The increasingly onerous and complicated federal and state regulations associated with EHRs (which fail to eliminate the most important problems),^{15,27} including malpractice implications and confidentiality issues associated with access to EMRs,^{1,34} discourage their adoption.

What Are the Solutions for Improving EHRs for the Allergist/Immunologist?

Some solutions for improving EHRs of special interest to the allergist/immunologist are listed in Table 3. Of considerable importance is the strong relationship between specific vendors and EHR system satisfaction, which indicates the variable quality of purchased EHR systems and their vendors. The Rhode Island report listed specific vendors and physician evaluations, which may be of use to physicians selecting new EMR systems for purchase.¹⁶ Physicians who have had the opportunity to use different EHR systems and vendors are able to discern the better system and often are more satisfied with that system than the poorer alternatives. Certain systems, interfaces, and vendors seem to get higher ratings.¹³ There are clear benefits provided by EHRs when used for order entry and reporting. These benefits include the following: remote access to data, medication error alerts, critical laboratory value alerts, and preventive care alerts.³⁵ However, even these reporting benefits have their downside: the laboratory technician or the radiologist does not often call the physician because he or she assumes that the information is available in the EHR; this is not always the case or the provider may not have reviewed the EHR.

There is a fundamental need for clear proof that the use of EHRs significantly and positively improves patient care (*i.e.*, they are worth the time invested by health care providers).¹² Perhaps a well-funded rigorous study of the effects of an EHR on patient outcomes for allergists/immunologists would provide convincing data, such as by the proposed pediatric collabora-

tive.³⁶ It is also necessary for both regulators and vendors to solicit meaningful involvement from physicians, especially pediatricians^{21,27} and subspecialists, *e.g.*, allergists/immunologists, concerning their specific data element needs (what is important and how should it be displayed).⁸ The need for EHR systems specifically targeted for the pediatric patient as extensively reviewed by Lehmann and Council on Clinical Information Technology²² details instructions for EHR vendors. In addition, physicians with experience using various EHR systems, interfaces, and vendors should be consulted regarding their previous experience with this technology specifically directed at fostering patient-appropriate software, reducing system errors, and solving interoperability issues.²⁷

Proof that EHRs are cost effective must be obtained, including consideration of start-up and maintenance costs as well as the cost of workflow decreases for practicing allergists/immunologists. Refinement of hardware and software is also needed to solve issues regarding data entry and extraction and requires much more attention.^{27,28} The waste of physician time and energy detracts from attention to diagnostic clues and complex management issues regarding patient care. Physician data entry is often a waste of money and results in frustration, which leads to burnout and early retirement, and ultimately restricts patient access to care. The degree of "copying and pasting" is a particular problem because it leads to errors and distracts from more important diagnostic evaluation and treatment decisions.²⁷

How much of the data can the patient reliably provide before seeing the physician? Could the physician dictate some of the data elements into the EHR with a summary note, including a problem list, differential diagnosis, and orders, perhaps to a medical scribe^{2,3}? Can some of the physical examination be electronically measured and automatically transmitted into the medical record? Can bar-coded data entry be used more

generally? The allergist/immunologist should be able to decide what data are necessary to extract or generate an alert, or for research needs as well as how much and which data need to be re-presented to the provider at each visit. Allergists/immunologists need to consider these data entry and extraction issues so that they can choose the best solutions for their own practices.

Some of the issues listed above have recently received attention from physicians,³⁷ with important support from the American Medical Association. The issue of patient medical record security has recently reemerged in importance, with stories about institutions being “held hostage” by hackers who stole patient data. Maximal efforts must be made to protect the security of EMRs.³⁸

CONCLUSION

Allergists/immunologists will probably have to come to terms with EMRs within a few years. The government and, indeed, all of us have a vested interest in cost-effective and user friendly systems that can decrease the aggregate cost of medical care and improve patient safety. EMRs currently are burdened by significant issues that detract from their value and utilization. There are solutions to these issues for which allergists/immunologists and other physicians must strongly advocate.

ACKNOWLEDGMENTS

The author thanks the librarians, Elizabeth Herron and Jeannine Creazzo, at the Saint Peter's University Hospital for their invaluable assistance.

REFERENCES

1. Reboot: Re-examining the strategies needed to successfully adopt IT, S. Rep. No. 2520 (2013).
2. The American Recovery and Reinvestment Act of 2009, Pub L No. 111-5, 123 Stat 230 (2009).
3. Gellert GA, Ramirez R, and Webster SL. The rise of the medical scribe industry: Implications for the advancement of electronic health records. *JAMA* 313:1315-1316, 2015.
4. Lyons JP, and Klasko S. Introduction of an electronic medical record system into physician practice offices: Why is it so #%&!&-ing hard for everyone? *J Med Pract Manage* 26:317-322, 2011.
5. Taylor D. School vaccinations and exemptions: What parents should know. *FindLaw*. August 18, 2014. Available online at http://blogs.findlaw.com/law_and_life/2014/08/school-vaccinations-and-exemptions-what-parents-need-to-know.html; accessed September 15, 2015.
6. Luna A. Spokane schools begin to enforce state vaccine law. *KXLY.com*. April 13, 2015. Available online at <http://www.kxly.com/news/spokane-news/spokane-schools-begin-enforcing-state-vaccine-law/32348184>; accessed September 15, 2015.
7. Namibian P, Kreps GL, and Polit S. Understanding medical record adoption in the United States: Communication and sociocultural perspectives. *Interact J Med Res* 2:e5, 2013.
8. Blain F, Ramos C, Shah A, et al. Lessons from the Literature on Electronic Health Record Implementation. Final Report. Urban Institute Health Policy Center. Washington (DC) to the Office of

- the National Coordinator for Health Information Technology USDHHS. Washington (DC), 2013.
9. Lakbala P, and Dindarloo K. Physicians' perception and attitude toward electronic medical record. *Springer plus* 3:63-71, 2014.
10. Grabenbauer I, Skinner A, and Windle J. Electronic health record adoption: Maybe it's not about the money: Physician super-users, electronic health records and patient care. *APL Clin Inform* 2:460-471, 2011.
11. Rosenbaum L. Transitional chaos or enduring harm? The EHR and the disruption of medicine. *N Engl J Med* 373:1585-1588, 2015.
12. Mazzolini C. EHR holdouts: Why some physicians refuse to plug in. *Med Econ* 90:42-44, 46, 2013.
13. Lowes R. Most Physicians Can't Get No EHR Satisfaction. August 12, 2015. *Medscape*. Available online at http://www.medscape.com/viewarticle/849402#vp_1; accessed August 14, 2015.
14. Lehmann CU, O'Connor KG, Shorte VA, and Johnson TD. Use of electronic health record systems by office-based pediatricians. *Pediatrics* 135:e7-e14, 2015.
15. Miller D, Noonan K, Fiks AG, and Lehmann CU. Increasing pediatrician participation in EHR incentive programs. *Pediatrics* 135:e1-e4, 2015.
16. Wylie MC, Baier RR, and Gardiner RL. Perceptions of electronic health record implementation: A statewide survey of physicians in Rhode Island. *Am J Med* 127:1010.e21-e27, 2014.
17. The American Recovery and Reinvestment Act of 2009, Pub L No. 111-5, 123 Stat 243 (2009).
18. Riddell MC, Sandford KG, Johnson AO, et al. Achieving meaningful use of electronic health records in primary care. *J Am Board Fam Med* 27:772-779, 2014.
19. The American Recovery and Reinvestment Act of 2009, Pub L No. 111-5, 123 Stat 468, 469 (2009).
20. Shoppmann MJ, and Guillermo JB. Transitioning a practice to electronic medical records. *N J Pediatrics Winter* p. 27, 2014.
21. McCoy MJ. Electronic medical records: Caveats for users. *Clin Obstet Gynecol* 55:605-612, 2012.
22. Lehmann CU, and Council on Clinical Information Technology. Pediatric aspects of inpatient health information technology systems. *Pediatrics* 135:e756-e768, 2015.
23. The American Recovery and Reinvestment Act of 2009, Pub L No. 111-5, 123 Stat 259 (2009).
24. Breaking Through the Regulatory Red Tape. July 24 and September 29, 2015. Webinars sponsored by the American Medical Association. Available online at <http://breaktheredtape.org/>; accessed July 24 and September 29, 2015.
25. Slight SP, Berner ES, Galanter W, et al. Meaningful use of electronic health records: Experiences from the field and future opportunities. *JMIR Med Inform* 3:e30, 2015.
26. CMS.gov. Medicare and Medicaid EHR Incentive Program Basics. Available online at <https://www.cms.gov/regulations-and-guidance/legislation/ehrincentiveprograms/basics.html>; accessed February 1, 2015.
27. Bowman S. Impact of electronic health record systems on information integrity: Quality and safety implications. *Perspect Health Inf Manag* 10:1c. eCollwction 2013, 2013.
28. Terry AL, Stewart M, Fortin M, et al. Gaps in primary health-care electronic medical record research and knowledge: Findings of a pan-Canadian study. *Healthc Policy* 10:46-59, 2014.
29. Moskow JM, Cook N, Champion-Lippmann C, et al. Identifying opportunities in EHR to improve the quality of antibiotic allergy data. *J Am Med Inform Assoc* 23:e108-e112, 2016.
30. Bernstein K. Reporting of drug allergies for use in a national decision support system. *e-Health-For Continuity of Care*. 68-72, 2014. doi:10.3233/978-1-61499-432-9-68

31. Fernando B, Morrison Z, Kalra D, et al. Approaches to recording drug allergies in electronic health records: Qualitative study. *Plos One* 9:e93047, 2014.
32. Carspecken CW, Sharek PJ, Longhurst C, and Pageler NM. A clinical case of electronic health record drug alert fatigue: Consequences for patient outcome. *Pediatrics* 131:e1970–e1973, 2013.
33. Kern LM, Malhotra S, Barron Y, et al. Accuracy of electronically reported “meaningful use” quality measures: A cross-sectional study. *Ann Intern Med* 158:77–83, 2013.
34. Bayer R, Santilli J, and Klitzman R. New challenges for electronic health records: Confidentiality and access to sensitive health information about parents and adolescents. *JAMA* 313:29–30, 2015.
35. King J, Patel V, Jamoom EW, and Furukawa MF. Clinical benefits of electronic health record use: National findings. *Health Serv Res* 49(pt. 2):392–404, 2014.
36. EHR data from more than 1.2 million children harnessed for research. *AAP News*, July; p. 12, 2015.
37. Ratwani RM, Benda NC, Hettinger AZ, and Fairbanks RJ. Electronic health record vendor adherence to usability certification requirements and testing standards. *JAMA* 314:1070–1071, 2015.
38. Tipton SJ, Forkey S, and Choi YB. Toward proper authentication methods in electronic medical record access compliance to HIPPA and C.I.A. Triangle. *J Med Syst* 40:100, 2016. □

Copyright of Allergy & Asthma Proceedings is the property of OceanSide Publications Inc. and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.