What Can Electronic Medical Records Do For You?

How EMR Technology Can Affect the Processes of Clinical Care

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HISTORICAL PERSPECTIVE

Dr. Lawrence L. Weed is known as the "father of the problem-oriented medical record (POMR)." By introducing this key concept in medical informatics in 1969, he provided a way to audit medical records by focusing not only on what was done, but why.[1] Dr. Weed implemented a computerized version of the POMR at the Medical Center Hospital of Vermont, as part of the Problem-Oriented Medical Information System (PROMIS) project. This visionary computerized record-keeping system included touch-screen interfaces, which are commonly used in today's computer kiosks.

In 1968, Dr. G. Octo Barnett led a collaborative effort between the Massachusetts General Hospital Laboratory of Computer Science and the Harvard Community Health Plan to implement an automated medical record system.[1] The Computer Stored Ambulatory Record (COSTAR) which they developed supported direct patient care, billing, and quality assurance programs like the monitored follow-up of treatment after positive throat cultures for streptococcus.

Another important and parallel step was the development of the Health Evaluation through Logical Processing (HELP) system. This integrated hospital information system, conceived in the late 1960s by a team led by Homer R. Warner, provided decision support for health professionals and demonstrated that computer systems could not only replace much of the paper record, but could also improve the process of care by enhancing the use of that record.[1]

In 1991, the Institute of Medicine published The Computer-Based Patient Record: An Essential Technology for Health Care. This seminal document presented blueprints for the future of computer-based patient records (CPR). In the 1997 revised version, an expert committee explored the potential of CPRs to improve decisions about diagnosis and care, provided a database for policymaking, and attempted to answer these questions:

- Who uses patient records?
- What technology is available and what further research is necessary to meet users' needs?
- What should government, medical organizations, and others do to make the transition to CPRs?[2]

In September 1999, The Quality of Health Care in America Committee of the Institute of Medicine (IOM) concluded that it is not acceptable for patients to be harmed by the health care system, which is supposed to offer healing and comfort, and which promises to "First, do no harm." In an oft-quoted report entitled "To Err is Human: Building a Safer Health System,"[2] the Committee described a comprehensive strategy by which government, health care providers, industry, and consumers, could reduce preventable medical errors. One of the report's main conclusions is that errors are caused by faulty systems, processes, and conditions that not only fail to prevent mistakes, but often actually lead people to make them. In its November 2003 report, "Patient Safety: Achieving a New Standard of Care," the IOM encouraged hospitals and physicians to adopt *electronic medical records* (EMRs) as a major step toward preventing medical errors.[3]

In 2003 the RAND Health Information Technology (HIT) Project began a study of EMRs with two objectives:

1. To better understand the role and importance of EMRs in improving health care;
2. To encourage government actions that could maximize the benefits of EMRs and increase their use.

The RAND study estimated the potential savings, costs, and health and safety benefits of EMRs if it is assumed that interconnected and interoperable EMR systems are adopted widely and used effectively. Some of the key findings of their study included:

- Health Information Technology would save money and significantly improve healthcare quality.
- The annual savings from efficiency alone could exceed $77 billion.
- Health and safety benefits could double the savings while reducing illness and prolonging life.
- Obstacles to adoption of EMRs include market disincentives because in general, those who pay for Health Information Technology do not receive the related savings.[4]

In response to these findings, the Federal government recognized its responsibility to improve health care quality, efficiency, and equity, and established the goal that nearly every American should have an EMR within ten years.[5]

But despite th involvement of federal agencies such as the Centers for Medicare & Medicaid Services (CMS), the National Committee for Quality Assurance (NCQA), and the Agency for Healthcare Research and Quality (AHRQ), electronic systems have been adopted by only a small number of physicians and hospitals. DesRoches looked at the adoption of electronic medical records among 2,758 primary care physicians. Only 4% reported having an extensive, fully functional, electronic records system, and 13% reported having a basic system.[6]

The remainder of this article will define the differences between a basic and a *fully functional* EMR, describe Personal Health Records, highlight the barriers to adoption of EMRs, explain their benefits, examine the changes in workflow that take place when they are implemented, and provide a framework for selecting an EMR system.

EMR, EHR, ePHR, WHAT'S IN A NAME?

It is vital to distinguish the Electronic Medical Record (EMR) from the Electronic Health Record (EHR). The Healthcare Information and Management Systems Society (HIMSS) composed a white paper to illustrate the differences in 2006.[7] The EMR is the legal record created in hospitals and ambulatory environments and it is the source of data for the EHR. The Electronic Health Record is composed of data from multiple functional EMRs at various Care Delivery Organizations. It thus represents and facilitates the exchange of clinical data and information among stakeholders within a community, region, or the nation. The stakeholders who share medical information may include patients/consumers, healthcare providers, employers, and/or payers/insurers, including the government.

- A *basic* Electronic Medical Record is a computer application that may contain patient demographics and clinical data, allow for simple documentation, ordering of prescriptions, and viewing of laboratory and radiology results.
- A *fully* functional Electronic Medical Record is a more robust computer application which contains clinical data, provides support for clinical decision making, uses a controlled medical vocabulary, accepts computerized entry of orders by providers for medications and diagnostic tests, and has other features for clinical documentation. Robust, fully functional EMRs can be used across inpatient and outpatient environments. While using an EMR, healthcare teams document, monitor, and manage health care delivery within a care delivery organization (CDO). The data in the EMR constitute the legal record of what happened to the patient during their encounter at the CDO, and the EMR is owned by the CDO.
- An electronic Personal Health Record ("ePHR") is defined by HIMSS as "a universally accessible, layperson comprehensible, lifelong tool for managing relevant health information, promoting health maintenance, and assisting with chronic disease management via an interactive, common data set of electronic health information and e-health tools." The ePHR is owned, managed, and shared by the individual or his or her legal proxy(s) and must be secure to protect the privacy and confidentiality of the health information it contains. It is not a legal record unless so defined and is subject to various legal limitations.[8]

With the increasing prevalence of EMRs, it is important to know the differences among them, especially when selecting a system for use in an office or hospital system. These differences can best be illustrated by an example in a clinical practice:

A nephrologist uses an EMR in his office to document a patient's visit and to prescribe medications electronically. The nephrologist then leaves the office to admit another patient at the local hospital. This patient has been seen at multiple health systems in the city over the past 5 years. Using the hospital's EHR, the nephrologist can review

clinical data from not only the current hospital, but also from the surrounding competitor health systems as well. Those health systems previously agreed to share clinical data within their EHRs. When the patient is discharged, she can review her diagnoses and follow-up plans in her ePHR at home.

Several examples of Personal Health Records have been in the news in the past several months:

1. Google Health advertises that their free and secure record will:
   - **Organize** your health information all in one place
   - **Gather** your medical records from doctors, hospitals, and pharmacies
   - Keep your doctors **up-to-date** about your health
   - Keep you more **informed** about important health issues

2. Microsoft notes that individuals can use their HealthVault to connect with doctors, hospitals, personal health and fitness devices, and dozens of health sites on the Web to help achieve health goals.
3. In response to Google and Microsoft, Epic Systems Corporation has introduced their own ePHR system named "Lucy" that allows patients to maintain their own records. Even if a patient goes to a different hospital without Epic products, their information can be transferred to a new provider.

Access to these records does not come without risk. Consequently, the Certification Commission for Healthcare Information Technology (CCHIT) created a task force in July 2008 to address this issue of protecting patient health information. In addition, CCHIT contends that PHRs should be able to send and receive data from as many potential sources as possible, including ambulatory EHRs, hospital EHRs, payers, pharmacies, and laboratories.[9]

BARRIERS TO ADOPTION OF EMRs

The two most common factors that impede the adoption of EMR in private practices are early start-up costs and uncertain financial gains, according to a 2004 study by Miller and Sim.[10] They noted that up-front costs for EMRs ranged from $16,000 to $36,000 per physician. During the initial weeks of using a new system, many practices also see fewer patients and spend more time entering data into their EMRs, which leads them to work longer days.

Not only will physicians spend more time seeing patients and using the new EMR, but they will also have to spend quite a bit of time preparing the system for use in their offices. The physician or the office staff will have to set up screens, options, methods of documentation, and order entry. These tasks may seem overwhelming in the months prior to using the system, and the offices without a physician who champions this effort may fail in their quest for the efficiency, financial savings, and improved quality it can provide.

Beyond the configuration of hardware and software, the office physician champions must also spend their time engaging and training colleagues in the months prior to introduction of the system. Successful offices engage in a rigorous process of analyzing workflow for such tasks as refilling prescriptions and abstracting charts. In order to access clinical data from the chart, physicians, nurses, and/or office staff must manually type problems, allergies, medications, immunizations, and past history into the EMR. Depending on who does the abstraction, this adds increased time or money to the conversion to the electronic record.

Another barrier to adoption is the current lack of data exchange among different EMRs and existing practice management systems. The typical office is deterred by the cost, complexities, and maintenance required to share data among different systems. Ideally, an office will buy a practice management system from the same vendor as their EMR, thus eliminating the need for a computer program that allows the two different systems to share data. Such sharing enables the office staff to use scheduling and registration data plus clinical data from the EMR to generate codes and charges automatically.

Data exchange is also an issue among EMRs and laboratory or radiology systems at area hospitals or testing centers. The necessary computer programs for such exchanges are either unavailable, or are costly to maintain and upgrade, with the result that paper reports must be scanned into the system. In order to track results over time, for reporting or for pay-for-performance purposes, staff must then manually enter those results into the EMR. This additional work makes Medicare's Physician Quality Reporting Incentives (PQRI) hard to realize. In addition, another interface is necessary to electronically prescribe medications. As the

EMR is upgraded or e-prescribing standards change, this computer-to-computer interface will require updates and maintenance.

Adoption will be slow as long as physicians continue to pay for these EMR systems while consumers and payers reap the savings. Even with wide adoption, true healthcare transformation will not occur without the standardization and improved interoperability of EMR systems.

THE BENEFITS: IT'S ABOUT MAKING THE OFFICE PAPERLESS, RIGHT?

Predictions based on statistical models suggest that Health Information Technology has the potential to assist in dramatically transforming the delivery of health care, making it safer, more effective, and more efficient. However, published studies thus far do not allow firm conclusions about which functionalities are most likely to achieve certain health benefits. The assessment of costs is even more uncertain.[11]

Chaudhry et al. systematically reviewed the evidence on the effect of health information technology on quality, efficiency, and costs of health care.[12] After examining 257 studies that met the inclusion criteria, quality benefits included increased adherence to guideline-based care, enhanced surveillance and monitoring, decreased medication errors, and decreased utilization of care. The highest quality studies came from 4 academic institutions with their own internally developed systems, and there was little evidence from commercial systems about improvements in quality and efficiency.

Nonetheless, the literature and EMR vendors suggest there are several benefits. Miller and Sim note that the path to quality improvement and financial benefits lies in getting the greatest number of physicians to use the EMR rather than paper for as many of their daily activities as possible. The key obstacle in this path is the extra time it takes physicians to learn to use the EMR effectively for their daily tasks.[10] The potential benefits in quality and efficiency are only realized if all relevant data are included in the EMR. If most information is documented in the electronic chart, but the patient's allergies or medications are recorded on paper, there is a potential for adverse medical events.

RE-ENGINEERING OF PROCESSES

It is critical to analyze the work processes in the office or hospital prior to implementation of EMRs. There may be greater benefit from re-engineering of processes than from the EMR software itself. Merely eliminating paper-based processes by substituting an electronic version will not automatically improve efficiency and safety. Consequently, Miller and Sim examined some basic clinical workflows and possible EMR benefits.

Viewing

Based on their structure alone, EMRs improve availability of charts, as well as the organization and legibility of data, so that office staff spends less time filing charts and the documents within them. When indexed properly, notes, scanned documents, and results are easy to read, but to create an easily reproducible process for finding data, EMR champions first need to understand how the system organizes data.

Documentation

Most EMRs offer a variety of documentation choices to accommodate current practices, including typing, the use of pre-defined templates, voice recognition, or dictation. Although typing and templates are not quick, they produce notes which are readable and immediately available. With initial planning and consideration of processes, champions could create templates that present relevant laboratory data or trigger physician action based on previous patient history or evidence-based questioning. However, although templates may result in a decrease in transcription costs, there is the potential for a decrease in quality and content if documentation is not carefully planned prior to using the system.

Ordering and Reporting

Although some see the advent of Computer Physician Order Entry (CPOE) as simply a way of pushing additional clerical work to the physician, clinical decision support during ordering has the potential to reduce adverse medication events and improve patient safety. At the point of ordering, physicians are warned by electronic systems about potential medication interactions or allergies, and are prompted to make necessary adjustments in doses for weight or renal failure. The available data suggest that roughly eight million adverse outpatient events occur each year, of which one-third to one-half are preventable. About two-thirds of preventable adverse drug events might be avoided through widespread use of ambulatory CPOE. Each avoided event saves $1,000–$2,000 because of avoided office visits, hospitalizations, and other care.[4] In addition, some EMRs can suggest formulary alternatives like generic substitutions which could potentially

improve patient adherence. With electronic prescribing, physicians and staff will also spend less time calling in refills and correcting errors.

Decision support at the point of care can also prompt the physician with timely evidence-based clinical guidelines. This could include a wide array of preventative care services including vaccinations and screening for breast cancer, cervical cancer, and colorectal cancer. Decision support can also be combined with clinical feedback that tracks personal and practice performance, thus improving quality and efficiency of care for patients and populations.

Messaging

The ability to exchange messages among staff members, physicians, and nurses within the EMR can improve the timeliness and accuracy of communication. Remote access of charts from outside the office allows physicians to respond to messages, document calls from patients, place orders, or prescribe medicines. Advanced EMRs can provide faxed communications to other providers even if they are not using the system, and allow patients to send secure e-mails to their physician's office. Both of these capabilities can enhance coordination of care and patient satisfaction. Further, patients who can access their record electronically via a PHR may call the office less for scheduling, refills, and questions.

Billing

With the integration in one EMR of patient demographics, the clinical record, and the billing and practice management system, there is improved capture of charges, less manual coding and charge entry, and the potential for improved reimbursement from payers. This connection of EMR with billing can also enhance future participation in pay-for-performance programs like PQRI.

A FRAMEWORK FOR EMR SELECTION

If your office has yet to select an EMR, the best practice is to have a plan in place before meeting with the vendors. In order to prevent a vendor from controlling your practice's EMR decision, Adler provides a potential selection plan.[13]

- First, solidify office, group, or organizational commitment to the project and identify your decision makers.
- Selection of a vendor must include physician leadership, and must not be made solely by the office manager or group administrator.
- Before evaluating specific vendors, clarify your goals and objectives. Consider your office workflow and potential improvements that you can make to enhance quality or patient satisfaction.
- Research the types of functions that are available in EMRs. For example, consider how your office schedules and registers patients, documents notes, places orders, handles telephone triage, refills medications, provides patient instructions, and completes the bills. When you analyze your current workflows and identify your future goals early in the process, you will be able to make the most appropriate selection for your group.
- Compose a Request for Proposal (RFP) with your goals in mind, and send it to potential EMR vendors. This document will inform them about your practice and your priorities for EMR functionality based on your goals. In addition, you should request information about their product, hardware/software requirements, customer training/support, implementation success in similar practices, warranties and a sample contract.
- RFP answers will allow your office to narrow the choices for a vendor and request a live demonstration.
- Following the demonstrations, be sure to check with at least three vendor references including physicians, administrators, and information services staff.
- Consider site visits to offices that have implemented the EMR from your list of vendor finalists.
- Select a finalist, but have a second-choice in mind. This will prove helpful during the contract negotiation process. Although this process may seem overwhelming and lengthy, the initial time spent will greatly improve your implementation, relationship with the vendor, and enable office consensus for the right selection for your group.

CONCLUSION

Although we have seen the impact of technology on clinical care processes for the last five decades, we stand at a critical turning point. Will we find new ways to overcome barriers to adoption? Will the benefits ever truly outweigh the barriers? With increasing EMR affordability, availability, and potential to improve quality, the evolution in healthcare transformation will continue.

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