

Virtual Mentor

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HISTORY OF MEDICINE

Development of the Electronic Health Record

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President Obama's support for a national system of electronic health records (EHR) in his American Recovery and Reinvestment Act of 2009 has focused much attention on the inadequacy of current medical recordkeeping procedures. Since many resident physicians currently use EHR and nearly all will be using them in the future, it may be of value to understand the evolution of the current EHR system, the key players in its development, and resources for further study.

Much interaction with EHR is less than ideal. System crashes paralyze clinics, poor system response times test user patience, multiple system passwords create redundancy and frustration, and overreliance on EHR in lieu of direct interspecialty communication can impair patient care. Despite these problems, there are advantages to using EHR, and its continued existence is as certain as the Internet's.

While the economics of health care in the past few decades has driven the transition to EHR, there are other important reasons for its implementation, and it is advantageous for medical professionals to embrace "the future," as it has become the present. The good news is that EHR provides many benefits to health care personnel. Some benefits are found in the medical record itself: increased legibility and comprehensiveness and easier access to information, to name three. Researchers also can identify subjects and track quality of care more easily. Although new types of errors have been introduced, many errors can be eliminated with features such as computerized physician order entry. Health workers' access to all of a patient's health care information at a given institution is another major advantage. For example, when a nephrologist sees a patient one day, a general practitioner who sees the patient later in the week has access to vital signs, growth changes, physical exams, labs, and interventions documented during the earlier visit. Physicians can also view patient records from home, allowing them to monitor hospital patients closely overnight. Additional benefits include those less tied to patient care but still vital to the health industry, such as workforce efficiency.

The Healthcare Information and Management Systems Society (HIMSS) provides a concise definition of the complicated idea that is the electronic health record:

The Electronic Health Record (EHR) is a longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting. Included in this information are patient demographics, progress notes, problems, medications, vital

signs, past medical history, immunizations, laboratory data and radiology reports. The EHR automates and streamlines the clinician's workflow. The EHR has the ability to generate a complete record of a clinical patient encounter—as well as supporting other care-related activities directly or indirectly via interface—including evidence-based decision support, quality management, and outcomes reporting [1].

The Evolution of EHR: Early Work

Different types of EHR have been developed by academic medical centers, the government, and industry. The goal—to compile the above information (e.g., patient demographics, progress notes) so they can be readily viewed and managed in one place—is not easily achieved.

Development of EHR can be divided into two major time periods. Early efforts began in the 1960s and '70s, when academic medical centers developed their own systems. Beginning in the 1980s, leaders saw benefits to industry-wide standards and began forming organizations to tackle the broader issues that would facilitate the widespread use of electronic medical information.

The first EHR systems were known as clinical information systems. In the mid-1960s, Lockheed developed one such product, which has since been handed down to the vendor Technicon, then to TDS Healthcare, and then to Eclipsys, now part of Allscripts [2]. It influenced later systems because its processing speed and flexibility allowed many users in the system at once [3].

Around the same time, the University of Utah collaborated with 3M to begin developing Health Evaluation through Logical Processing (HELP), one of the first clinical decision support systems. Then, in 1968, the Computer Stored Ambulatory Record (COSTAR) began at Massachusetts General Hospital. Developed in collaboration with Harvard, COSTAR included some novel features. Its modular design allowed the system to be separated into parts; for example, the accounting portions of such a system need not include clinical information and excluding extraneous information increases efficiency. The system also had a flexible vocabulary; its database recognized multiple terms for the same disease, which allowed users to recognize a given condition across the health system despite variations in terminology at different institutions [3].

The federal government began using EHR in the 1970s with the Department of Veteran Affairs' implementation of VistA, originally known as Decentralized Hospital Computer Program (DHCP). Many former resident physicians and medical students have used the VA's Computerized Patient Record System (CPRS). The VA has unique access to federal resources, of which its EHR has taken full advantage [3]. It is consistently well reviewed for reducing medical errors and improving health-record component integration [4].

More Recent Developments

Since the 1980s, more concerted efforts have been made to increase use of EHR. The Institute of Medicine (IOM) recognized the need for serious analysis of paper health records and, in the mid-1980s, undertook such a study, publishing results in 1991 and again with revisions in 1997 [3]. This report was the first to argue the case for using EHR, identifying it as one of seven key recommendations for improving patient records, and to propose a means of converting paper to electronic records. It also identified barriers to EHR adoption (lack of standards, security issues, cost) and suggested both private and public funding for their development. When private industry became aware of the IOM's findings, supporters formed the Computer-Based Patient Record Institute (CPRI), which helped break down barriers to EMR development. (It has since merged with the Health Information and Management Systems Society, HIMSS.) In 2000, the IOM published a study of medical errors, *To Err is Human*, concluding that health care would be safer with such systems as computerized physician order entry in place [5]. The IOM has also collaborated on the development of an electronic standards organization, HL7 [3].

HL7 is an international, nonprofit standards-developing organization (SDO) that began in 1987. Though not the only such SDO, it is the most widely recognized. HL7 develops electronic standards to ensure that the components of an EHR (such as a health center's billing and clinic information) can communicate more easily, resulting in a working electronic health record system. Since one EHR system often contains components made by many different vendors, standards that specify items, e.g., the computer language components will use, are essential for optimal functioning. HL7 and other standards promoters also hasten industry development [6]. An oversight organization, the Certification Commission for Healthcare Information (CCHIT), has been certifying vendors as HL7-compliant since 2006 [7].

EHRs have appeared in the national political forum, indicating widespread concerns about recordkeeping's effect on public health. President Bush made mention of the topic in his 2004 State of the Union address [2], and President Obama incorporated EHR into his American Recovery and Reinvestment Act of 2009 as part of the Health Information Technology for Economic and Clinical Health Act (HITECH). This act provides for higher payments to health care providers that meet "meaningful use" criteria, which involve using EHR for relevant purposes and meeting certain technological requirements [8]. "Meaningful use" has become controversial because it mandates transition to EHR for physicians and hospitals that treat patients covered by government insurance. More specific definitions of meaningful use and acceptable technologies are available on the U.S. Department of Health and Human Services web site [9].

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Further Reading

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