

THE ELECTRONIC PATIENT RECORD - A MODEL FOR THE FUTURE DIRECTION OF HEALTH CARE

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ABSTRACT

Medical and diagnostic errors often occur because complete patient information is not available at the time of patient care. An integrated Electronic Patient Health Record (EPHR) system could help resolve these problems. The EPHR model explains how the integration of every department creates a synergy between departmental systems by allowing data to be captured at any location in a physicians' office or the hospital. A physician's EPHR consists of an individual's health/medical information from "birth to death." This paper discusses the use and impact of an EPHR system and its relation to the EPHR model, which defines the electronic patient system and its components. Furthermore, this paper describes a study that determines how many physicians, group practices, and hospitals currently use an EPHR in order to determine the level of EPHR implementation to improve the quality of patient care.

Keywords: Electronic Patient Record, system, EPHR, medical, health, information system

INTRODUCTION

Medical and diagnostic errors often occur because complete patient information is not available at the time of patient care. An integrated Electronic Patient Health Record (EPHR) system can help resolve this problem. An EPHR - "the holy grail of healthcare computerdom," - (13) is a computer-based database of information about an individual's health and care throughout their lifetime, with "the record focused on and around the patient across settings of care, across disciplines, and across time" (8). The EPHR system model integrates patient information into a single record, which allows data to be captured and accessed from any physicians' office or other care location.

The EPHR health model is more patient oriented than the traditional medical model. Theoretically, a physician's EPHR for any patient consists of that individual's "birth to death" health/medical information. In practice, an EPHR system may be less than complete or less than completely functional for many reasons (6). Healthcare has lagged behind other industries in patient record technology, even though the use of computers for billing and accounting functions is common (17). There are many small physicians' offices, as well as large metro hospitals, that are only automated in the administrative functions. What is necessary is a tool enabling improved patient documentation (14). This tool is the EPHR--and so a new paradigm emerges.

The EPHR helps to eliminate unnecessary paper work as well as medical and pharmacological errors. According to a recent study, the average physician spends 35 percent and the average nurse spends 50 percent of his/her time on paperwork (12). In addition, one of the largest obstacles to patient care in the 90's is access to patient information (11). One study reported that when records were on paper relevant information could not be located 81 percent of the time; 32

percent of the patients were asked to repeat tests, or decisions were made without important information (11). Another 1998 study found 28 to 32 percent of all leading facilities admitting that relevant patient information is not available at the time of care (20). Compare this to an airplane trip where just before take off the pilot welcomes the passengers with the following greeting, “Welcome to our fantastic airline. I must admit that 32 percent of my flight instruments are not transmitting, but I’ll work through it somehow” (20).

The primary goal of an EPHR is to have data accessible and legible at any time, anywhere, and to provide high quality care for patients. Due to many management and technological changes in the healthcare industry, being able to measure and improve quality of care is extremely important. Some obstacles that stand in the way of obtaining an EPHR are organizational readiness, security and confidentiality, a need for standardized terminology, and technical issues (20). In order to study the impact and use of EPHR systems in the real world, this study reports on preliminary research to determine the level of implementation of those systems in the health care community.

BACKGROUND

Barriers to EPHR Implementation

One of the most significant barriers to development and implementation of the EPHR system, other than cost, is not taking into account the organizational cultures, processes, and leadership of the health care community (10, 9). Surveys report that the biggest factor holding back implementation of EPHR systems is the lack of organizational readiness (1). Even when barriers such as costs of systems, return on investments, and lack of suitable products no longer exist, organizations are still not ready to change because employees fear job failure or job loss (1, 16).

Standardization

“Lack of standardized nomenclature is another of the problems with an EPHR system” (11). Currently, 150 different coding sets exist, with no comprehensive standard in the healthcare industry (16). Standard health content, vocabulary, clinical terms, and data format are necessary so that clinical information is captured in a consistent manner for structured analysis. Moreover, message standards are also needed to support electronic data interchanges between application systems. Use of standardized terms for symptoms and functional status such as SNOMED, ICD-9, ICD-10, NANDA, MEDRA, or CPT codes would enable physicians to consistently and efficiently describe the patients’ situation and permit interchange of data between systems (16).

Codification

Inserting data can be done with the tap of a pen on a screen or the click of a mouse, with visual confirmation on the screen that the data have been entered. This is possible, but not with simple or incomplete ICD-9 and CPT codes. These codes are primarily used for billing application purposes and they do not capture the content of an encounter. Furthermore, since the ICD-9 and CPT codes are commonly used for coding purposes and are well known, there is a resistance to change. Whenever possible, entries of observations, diagnosis, and orders should be reduced to a simple gesture in a graphical user interface (GUI). Eighty percent of the data captured for a patient can be entered by using a GUI and the other twenty percent of the data can be entered in free text or some other methods under development such as voice (14).

Benefits of EPHR Implementation

Overall, the EPHR provides easy access to test results, increases accuracy, quality of care, and legibility. The EPHR system will reduce frustration since records are easily accessible and paper documentation is minimized. This will increase the number of patients the care provider can see as the documentation workload decreases which increases productivity and revenue. Moreover, the EPHR system will increase available time, which may be spent with patients, and reduces billing, prescription, and lab errors (16, 17).

Medical/Diagnostic Errors

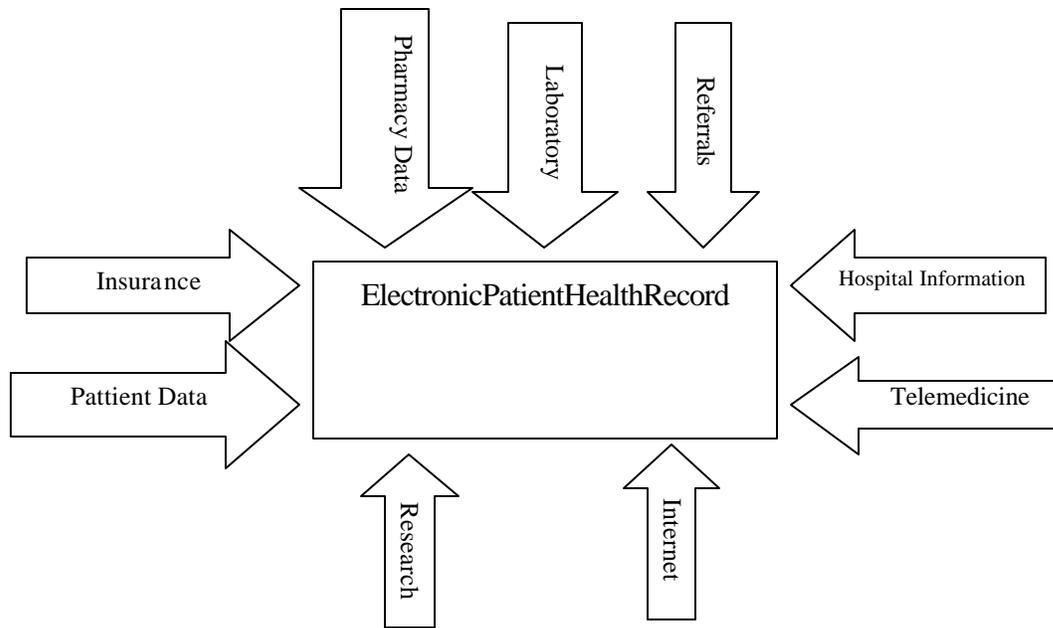
Luceian Leape, a Harvard University Professor, conducted a comprehensive study of medical errors in the United States. He asserted that estimates of 1 million patients are injured by errors during hospital treatment each year and that 120,000 die as a result. The number of deaths reported is equal to a jumbo jet crash and three times the 43,000 people killed each year in an automobile accident. Furthermore, Leape and his colleagues examined patient records in New York hospitals and in 1991 reported that one of every 200 patients admitted to a hospital died because of hospital error. Medical errors are not reported to the public, but those that are reported represent about 5 to 10 percent of the number of medical mistakes at a typical hospital (10).

Statistics from 1996, by the National Safety Council and Harvard School Public Health reported a number of deaths that occurred due to hospital errors and compared it to other accidental deaths in the United States. Medical errors added up to 120,000 deaths, motor vehicles 43,649, falls 3,959, and drowning 329 (10).

Information Systems

There is a need for well-designed information systems in healthcare, such as decision support systems (DSS), to process and provide data in different ways to support clinical and business decisions. Implementing a DSS is much more manageable and informative with a well designed database management system than many of the older system's still running today. Most computer based medical systems installed today are not portable, and patient information has to be recorded manually or dictated at bedside and then transcribed into systems, resulting in double documentation (2). Physicians need flexible and portable systems that allow greater accessibility such as small fast terminals at remote locations (i.e. workstation, bedside, etc), that would allow accessing multimedia records, high-resolution imaging, full-motion video, and elaborate coding schemes. In addition to quality, flexibility, security, and ease of use, health information systems of the future need to standardize, simplify, and clinically integrate the user interface for ordering, cumulative reporting, and sharing of the test results (7).

Each of the health systems should have some connectivity with the other systems to allow sharing of patient information across various providers and hospitals. The primary repository should be at the primary care physician level since they maintain the most comprehensive longitudinal information on the patient. Developing an EPHR system requires a model for information representation that is common across systems. A model of the EPHR system is shown below.



This model shows the interconnectivity of the various subsystems of the EPHR system. The subsystems are integrated and communicate relevant information. With the integration of the systems, primary care physicians can receive laboratory results immediately and track medications of their patients. Because of the systems integration, patient health information is remotely accessible.

The EPHR system model is designed around the primary care physician as the primary care giver and if necessary the patients are referred to a specialist. The specialist then reports the results of the treatment they administer to the primary care physician who will maintain the longitudinal record of the patient (4).

Organizations that have been most successful at implementing the EPHR are home healthcare and individual physician offices, while hospitals are using modules of the hospital information system where available. One-reason hospitals have a more difficult time implementing a longitudinal patient record system is the type of care traditionally provided at hospitals. Hospital care tends to be more episodic and delivered in shorter time frames (17). Initial investments in health/medical systems can be expensive, but the end result of improved patient care and satisfaction are worth the price and will pay for the system many times over in the long run. Studies have indicated that a satisfied patient is much less likely to initiate a costly lawsuit (3).

Types of Software

According to recent surveys, about 10 percent of physicians still do not have computers in their office (13). Those that do have computers do not use them for patient care, but instead they use them for business functions such as billings. A Harris Interactive survey reported in USA Today, gave the following breakout of physicians who use some technology as a integral part of their everyday practice: cellular/mobile telephone, 65%; voice mail, 42%; two-way pagers, 35%; laptop computers, 16%; and a handheld personal device, 10%. As EPHR systems are integrated into the healthcare organization, vendors are providing various software programs that support different aspects of the health care organizational needs.

The tenth annual HIMSS Leadership Survey sponsored by IBM, reported that out of 769 provider organizations, 11 percent responded that they had an electronic records system in place compared to only 2 percent the year before. Furthermore, 25 percent responded that they had developed a plan to implement an electronic health record, compared to only 15 percent the year before. Charlottesville, Va. plans to spend \$60 million within the next seven years to implement an electronic patient record system (19).

The Internet

According to 1998 HIMSS leadership survey, 95 percent of the respondents use the Internet in their healthcare facility (25). Many physicians currently offer telemedical advice over the net to their patients, and there are also physicians that provide telecare services to patients they have not physically seen. Today, the strongest growing business on the Internet is telepharmacy, “drugs arriving by mail” (15). The federal government (NASA and Department of Defense) has spent several million dollars for the development of telemedicine, which is a rapidly developing area of medicine today. A 1996 survey reported that out of the 2,400 rural hospitals, 17 percent were participating in some kind of telemedicine network and 13 percent were in the planning stage (9).

Confidentiality and Security

What worries many people is the apparent easy accessibility to records by unauthorized individuals. People don’t understand that paper documents are just as easily obtainable, or possibly more easily obtainable, by an unauthorized person as an electronic document (5). For example, a patient who belongs to an HMO goes to see their primary care physician, the physician provides patient information to the insurance company. The insurance company in turn gives patient’s health information to the Medical Information Bureau (MIB). If at any time an employer questions an individual’s health status and longevity they can contact the MIB and obtain once confidential health information about the individual. An EPHR system will not stop this practice, but with some legislation enacted, the EPHR system would be a more secure and accurate storage medium and it would be maintained by the primary care physician and the patient should have veto rights in who sees it (6).

Currently, existing federal laws protect only the data the federal government controls. State laws provide limited protection and apply only to limited kinds of health information (18). The Department of Health and Human Services has issued rules that prohibit members of the healthcare team from releasing patient information except in extreme cases or with patient’s permission (19). The Health Insurance Portability and Accountability Act of 1996 also sets security and confidentiality requirements (8). In order to protect EPHR information, healthcare organizations will have to work individually, collectively, and with relevant government entities to address a range of privacy and security issues (18). Additionally, the Medical Information Bureau, where insurers file information that raises questions about a person’s health status and longevity, should help protect medical records from getting into the wrong hands.

THE STUDY

Method

A number of technological and other factors are working to insure that the EPHR is the wave of the future in healthcare information management. However, it is also clear that a great deal of work needs to be done to overcome real and perceived problems with the implementation of EPHR systems. In order to help determine that level and to gain information on EPHR problems, successes, and future implementation, we designed and carried out a study which was intended to gather information on the current status of EPHR systems and plans.

Results

The survey resulted in a total of 107 usable responses, which was a 19.6% response rate. A description of the respondents by organization, department, and use of an EPHR system is: Organizations: Teaching Facilities: 67.3%; Other: 32.7%; Departments: Internal Medicine: 28%; Family Practice: 42.1%; Ob/Gyn: 14%; Other: 15.9%; EPHR Status: Operational: 27.1%; Begun to Install: 15.9%; Developed Plan: 14.3%; Not Begun to Plan: 32.7%; Don't Know/NA: 10.3%.

It seems interesting that, although respondents are heavily skewed toward teaching facilities, which would be expected to be on the cutting edge of technology use, only 27% report having a fully operational EPHR systems in place, while nearly 33% have not yet begun to plan a system. Clearly, EPHR system use is only in the beginning stages.

For organizations with installed EPHR systems, two other aspects of the research are of particular interest. Nearly 75% report systems with the ability to allow remote access, such as a connection over the Internet from a physician's home. Over 70% report systems with five or more specific modules installed, the most popular of which are modules for lab tests, physician use, and appointment scheduling. Of particular note is the lack of use of EPHR systems with billing capabilities. The features of the installed systems are: Remote Access Possible: 74.4%; Total Number of Modules Installed: 1 module 2.2%; 2 modules 8.9%; 3 modules 6.7%; 4 modules 4.4%; 5 modules 22.2%; 6 modules 15.6%; 7 modules 4.4%; 8 modules 8.9%; 9 modules 22.2%. The percentage of systems with specific modules installed are: Laboratory 82.2%; Physician 80%; Appointment/Scheduling 80%; Pharmacy 68.9%; Nurse 68.9%; Search 60%; Referrals 48.9%; Notices 48.9%; Billing 44.4%.

The other interesting aspect of the research for those organizations with installed EPHR systems concerns satisfaction. About 46% of respondents are very satisfied or satisfied with the installed system, while about 26% are dissatisfied or very dissatisfied. This last number may be an indication of system problems, installation difficulties, user interface design, or lack of familiarity with the system on the part of respondents, many of whom indicated that system installation has been quite recent.

CONCLUSIONS

A key element in the re-engineering of healthcare is the EPHR model. It is important that the model be applied so that a wide range of medical systems and information resources are linked together and support each other. The EPHR system helps provide the highest quality of care at

the lowest possible price. The move to EPHR system constitutes a change in the way healthcare is traditionally managed. This new paradigm is not just a computerization of the old way, but it is the re-engineering of those processes to benefit the patient, physician, and the entire healthcare team (8). For this new paradigm shift to work, a commitment from physicians, nurses, administrators, patients, and other healthcare providers to work as a team is necessary.

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