

Patients' safety in the era of EMR/EHR automation



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ABSTRACT

Accurate maintenance of the medical records of patients has become a worldwide problem with the rapid rise in the count of patients. Furthermore, providing them adequate health care keeping their safety in view is turning into a great challenge for physicians. As such, electronic health records (EHRs) were developed to solve these issues by aiding physicians in imparting quality health care to patients as well as maintaining their safety. Nonetheless, rather than increasing their efficiency, EHRs have become a burden for the physicians as they ultimately increase their error rate and reduce output rate affecting patient safety. As health-IT is advancing progressively, new features are added to the existing EHRs with the aim to support physicians in providing better healthcare. Till date, some of the most advanced features include clinical support decision system (CDSS), computerized physician order entry (CPOE) system, health information exchange (HIE), mobile documentation application, and a system of safety alerts on a dashboard. Proper training to the physicians on judiciously usage of these EHR functions is required to extract maximum benefit. Else, these can introduce a considerable number of medical errors, which can result in fatal outcomes for the patients.

1. Introduction

EHR was introduced with the goal of aiding physicians and healthcare institutions in imparting quality health care to patients as well as maintaining their safety. EHR encompasses all the information regarding patient care such as demographics, progress notes, problems, medications, vital signs, medical history, immunizations, laboratory data, and imaging reports, which can be easily accessed at multiple sites to make health care accessible for patients. Overall, EHR does not refer to mere digitalization of patient's medical data and eliminating the need for paper records; rather it was conceptualized to deliver quality care to patients while maintaining their safety and maintaining the integrity of their records. The Institute of Medicine defined quality care as “the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge”. Even after more than two decades of its inception, EHR failed to achieve its goals entirely. Recent research by Sinsky et al. [1] showed that US physicians spent double the time in working with EHR compared to direct patient interaction during their office hours. Few doctors even spent 1–2 hrs of their time beyond their business hours working in EHR. This study reveals EHR as a burden for the physicians, which tends to affect the patient safety by increasing the chances of introducing medical errors. Further, it seems to decrease the patient turnout number per day.

Medical errors refer to the preventable adverse effect of patient care, which can be or cannot be harmful to the patients and include inaccurate or incomplete diagnosis, inappropriate treatment of disease, injury, behavior, or other ailments. Analyzing medical death rate data over an eight-year period, Johns Hopkins patient safety experts have calculated that more than 250,000 deaths per year are due to the medical errors in the U.S [2]. Some deaths are also due to “non-error adverse events of medications”. About 17 to 29 billion dollars of expenditure is estimated to be incurred in the country due to loss of income as well as household productivity and disability, which can be reduced by adopting an appropriately designed EHR and using it in a “meaningful way”. While implementing an EHR with best features to support physicians in the responsibility of the healthcare organization, using it in a meaningful way is solely dependent on the physician. Albeit a rise is recently seen in EHR adoption in different countries, its implementation with best functions is not well-defined. In developed countries, EHR usage with principal components was <10% for all the hospitals in each of these countries [3]. Main reasons for such low adoption included the negligence by the policy-makers of healthcare institutions and huge expenses required for maintaining and updating the EHR software. Other determinants of EHR usage in developed countries included design and technical concerns, ease of use, interoperability between departments, privacy and security, costs, productivity, familiarity with EHRs, motivation to use EHRs, user time/workload, organization size, IT support,

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training, the relationship between administration and health professionals, and the choice of the particular EHR system.

2. Health information software (HIS) adoption in Saudi Arabian hospitals

Health information software (HIS) refers to any system that captures, stores, manages, and transmits patient-related information, of which EHR forms the central component.

In a recent study, 82% of the medical practices in the United States reported that they had saved time through electronic prescriptions, while 75% saw their lab results being delivered faster. As such, compared to the other developing countries, EHR adoption in Saudi Arabia is better. In Riyadh region, by 2013, 50% of 22 hospitals had fully functional EHR, 36% had EHR up gradation in progress, and 14% of the hospitals had no EHR systems [4]. Bah et al. [5] estimated that 16% of hospitals in Eastern Province of Saudi Arabia used EHR systems by the year 2010. It is mainly due to the consistent effort put into from different departments of government of the Saudi Arabia [6]. This effort began in 2008 wherein the Saudi Health Council provided its approval for unified electronic health file project (i.e. combining numbering system, medical coding system, and standards procedures used in dealing with a health file), which would eliminate the duplicity in data entry, irrespective of the location of data storage, and maintain secrecy in information transfer. In 2010, National Guard Health Affairs (NG-HA), a leading healthcare provider in Saudi Arabia replaced the old EMR system and rolled out to a full new EHR system with advanced functionalities. The project took place during 2015 and 2016, involving two Academic Medical Cities with highly specialized institutions (located in Riyadh and Jeddah), other three secondary care hospitals (located in Dammam, Al Ahsa and Madinah) and tens of primary care centers distributed in Saudi Arabia. The King Faisal Specialist Hospital & Research Center (KFSH & RC) in Riyadh and Jeddah, have updated their EHR system through phase I (includes Enterprise Person Management, Enterprise Scheduling Management, Laboratory Information System, Radiology Information System and Computerized Physician Order Entry and Nurse Documentation), phase II (includes Pharmacy, Emergency Department, Medical Records, and Operating Room Information Systems) of Integrated Clinical Information System (ICIS) project.

Factors having a positive influence on the implementation of EHR included urban city, health system affiliation, hospital size, external incentives, academic/teaching hospital status, public hospital and proximity to EHR-adopting hospitals. On the other hand, the factors having negative effects on the determinants were maintenance costs of EHR and private hospitals [4].

3. Why we need an EHR?

Health informatics and Health-IT is continually evolving to make the existing EHR better by incorporating more functions such as clinical decision support system (CDSS) tools, computerized physician order

entry (CPOE) systems, and health information exchange (HIE) for supporting the physicians in reducing medical errors and increasing patient safety [7].

The Health Information Technology (HITECH) Act of 2009 in the United States have, in part, led to an adoption rate reaching about 80% of certified EHRs in acute care hospitals. The rate of electronic health record adoption has also increased worldwide. It has been suggested by some of the recent studies that, in the United States alone, there will soon be one billion patient visits documented per year in EHR systems. Several new EHR software have been launched in the recent time, some of which include AdvancedMD EHR Software, drchrono EHR, NueMD, MediTouch EHR Software, ClinicSource Therapy Practice Management Software and many more. All of these softwares are highly customizable and designed for special practices such as appointment scheduling, medical billing, allergy checks, electronic health recording, electronic prescribing, order management, lab tests and document management, patient engagement, and telemedicine, etc (Fig. 1).

A clinical decision support system (CDSS) is one that aids clinicians in making decisions concerning patient care. Few important functionalities of CDS system include updating with the latest information, cross-referencing the patient condition, and prompting alerts regarding potential patient issues that are flagged by the computer. With the continuous increase in medical information, these EHR functions act as an assistant to the clinician for delivering safe and efficient health care. With the widespread use of CDS, one can speculate preventable medical errors to be reduced leading to increased efficiency and patient safety. Similarly, the computerized physician order entry (CPOE) function permits physicians to enter orders (e.g., for drugs, laboratory tests, radiology, physical therapy) into a computer rather than doing so on paper, which is also known as e-prescription. Digitalization of prescribing tests and medication increases the efficiency of the nursing and pharmacy personnel as the requirement of inquiring the clinician concerning any misinterpretations or lack in information or difficulty in understanding illegible writing is removed, thus, eliminating the incidences of severe medical errors. When coupled with CDSS, COPE enhances the efficiency and quality of patient care and safety to a greater extent.

Another recently added feature, which has revolutionized the existing EHR, is Health Information Exchange (HIE). One can share the patient-level electronic health information between different health care institutions in a secure and timely manner through HIE, which can reduce the expenses incurred due to the repetition of tests when the patient moves from one healthcare institution to another. HIE unifies the patient's data stored in a variety of locations such as their primary care physician's office, specialist physician, pharmacies, emergency departments, and from different hospitals and helps in exchanging all the information collectively via EHRs, which makes health care more cost-effective and improves its quality.

Health smart card, also known as health ATM, is a type of HIE that is capable of providing non-volatile patient-related data electronically such as prior hospital stay, referrals, prior diagnosis and treatment details among clinicians, and other hospital personnel [6]. When a patient with

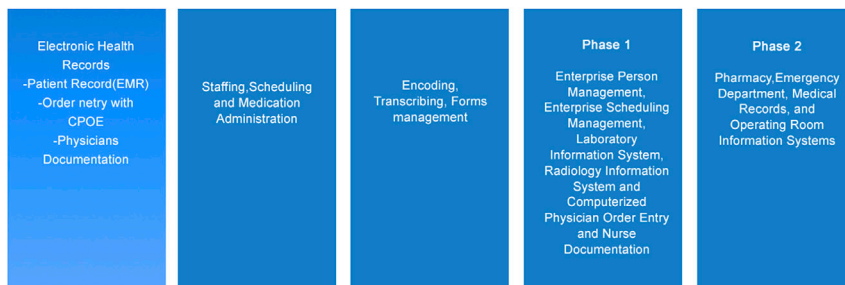


Fig. 1. Deployment of EHR systems.

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