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# Information Technology in Health Care: Global Opportunities and Challenges with Electronic Health Records

**Dr. Ramaiah Itumalla**

Designation : Assistant Professor

University of Hail, Kingdom of Saudi Arabia

## Abstract

*Information Technology is playing an important role in modern Health Care. An Electronic Health Records (EHR) has been gaining a significance place in management of health records. It has been replacing the paper-based health record and helping to improve the management of patients' related data, reduced errors and also improving the overall quality of health services. An Electronic health record is defined as a longitudinal electronic record of patients' health-related information that is created, gathered, managed, and consulted by authorized healthcare professionals and personnel.*

*The objective of the present paper is to discuss the significance of EHR and to present the Global opportunities and challenges in adopting the EHR in Health Care. The study is a descriptive in nature and based on the secondary data. The present paper explains that EHR can improve interoperability between different healthcare institutions, facilitate collaborative research projects, and allow for easier data sharing. However, challenges associated with EHR are High cost of implementing, issues with Confidentiality and Security of the patient data, Disintegration of EHR-HIT and insufficient exchange of patient data, Regulations/laws mandating the use and protection of electronic health care data capture and communication and lack of EHR design and development standards will be limiting the wide implementation of unified EHR system until a user-friendly platform that allows for controlled data sharing with maximum security. The paper argues for developing operation system-friendly platform that allows for implementation of unified EHR at national levels where it controlled by local health authorities and overseen by the Ministry of Health, and afterward at Global level.*

**Key words:** *Electronic Health Records, Information Technology, Health Care*

## Introduction to IT and EHR

Information Technology is playing an important role in modern health care organizations. Planning to utilize the latest technologies in the healthcare industry is an important strategy for many healthcare organizations to enhance healthcare services and reduce operations costs (Goldschmidt, P.G. 2005, Davidson, E et. al.. 2006, Klein, R. 2007). Information technology has great potential for improving quality and safety as well as for reducing costs and creating new service innovations (Shekelle PG, Morton SC, Keeler EB. 2006). Electronic Health Record (EHR) is at the centre of a health information technology system and most of the countries, and services have plans for, or have already introduced EMRs. Prescription order entry is often part of an EMR system and has been found to reduce medication errors and adverse drug events (Shekelle PG et.al. 2006).

An Electronic Health Records (EHR) has been gaining a significance place in management of health records in the modern hospitals. The Health Information Technology for Economic and Clinical Health (HITECH) Act, 2009 has been increased the public awareness about the advantages of implementation of HER (Ronquillo, J. G. (2012). An EHR is defined as a longitudinal electronic record of patients' health-related information that is created, gathered, managed, and consulted by authorized healthcare professionals and personnel. An EHR system includes demographic information, progress notes, complaints, medications, vital signs, laboratory results, past medical history, surgeries and procedures, immunization, and radiology reports (Jha, A. K. (2011; Menachemi, N., & Collum, T. H. 2011).

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The EHR market is estimated to be USD 13.64 billion in 2016 and is projected to reach USD 22.01 billion by 2021, growing at a CAGR of 10.03% during the forecast period from 2016 to 2021. Some of the factors contributing to the growth of the global EHR market are: Rising need for integrated healthcare systems, Initiatives and incentive programs launched by government in order to improve quality and efficiency of healthcare services, Maximized patient safety, Curtailed healthcare cost, Reduced prescription errors, Improved infrastructure, especially in developed countries, Implementation of EHR, Expansion of healthcare IT, Technological advancements and Increasing adoption rates of big data in healthcare. (Electronic Medical Records Market Report, 2017 - 2022)

### Significance of EHR

Paper Based Health Records Vs. EHR: An EHR can provide a significance benefits than the paper based health records. An EHR has been replacing the paper-based health records in the hospital settings. Paper-based health record system might be insufficient because it is easy to misplace or misfile information which may increase the error due to improper documentation (Menachemi, N., & Collum, T. H. 2011). Healthcare providers are expected to rely on their memories for service recommendation, and medication prescription (Jha, A. K. (2011). Paper-based health record system is time consuming and complex. Physicians are required to review complex charts to understand the patient case especially in cases of referrals (Zheng, K., Mei, Q., & Hanauer, D. A. (2011). In case of medication recall, it would be difficult to access all patients' charts to identify patients taking the recalled medication that left physicians largely dependent on governmental announcement to which not all patients may have access to (Seto, B., & Friedman, C. (2012). Paper-based referral systems allows for limited sharing of clinical information, are difficult to be sorted and accessed (Esquivel, A., et. Al 2012).

On contrary, an EHRs are easy to access eliminating poor penmanship (Menachemi, N., & Collum, T. H. 2011). Poor penmanship historically negatively affected the quality of inter-professional communication. Inaccurate interpretation of hand-written instruction especially in an in-patient setting led to serious complication (Winslow, E. H., et. al 1997; Rodríguez-Vera, F. J., et. al (2002). Mass utilization of EHR holds many potential advantages, but tree functionalities hold great promise in improving the overall quality of healthcare and reduce the cost the healthcare systems: clinical decision support system (CDSS), computerized physician order entry system (CPOE), and health information exchange system (HIE), those three capabilities in additional to other potential benefits of EHR meet the fundamental requirement of the HITECH act, 2009 (Menachemi, N., & Collum, T. H. 2011). It is worth to discuss in brief about these capabilities. Clinical Decision Support System (CDSS) assists healthcare providers in making decision with regards to patient care. Clinicians flag patient-related issues on a computer software. CDSS then provides the latest information on drug, allergic reactions, and alerts. CDSS ultimately aims to reduce errors related to diagnosis and medication prescription (Menachemi, N., & Collum, T. H. 2011; Richardson, W. C., et. al 2001). CDSS is any automated system that is designed to directly or indirectly aid in clinical decision making, in which characteristics of individual patient are used to produce a patient-specific assessment and/or recommendations that are presented to physicians for consideration and evaluation (Esquivel, A., et. al 2012; Menachemi, N., & Collum, T. H. 2011).

The Computerized Physician Order Entry System (CPOE) systems allow healthcare providers to enter orders into a computer software. Computerized order entry eliminates errors related to poor penmanship, and makes ordering process more efficient (Menachemi, N., & Collum, T. H. 2011). COPE may reduce serious medication errors by 55% if used alone and by 83% when linked with CDSS (Bates, D. W., et. al 1999). Health Information Exchange System (HIE) is the process of sharing clinical information between different organizations (The National Alliance for Health Information Technology. Report, 2013; Walker, J., et. al 2005). HIE allows for secure, real-time sharing of clinical information that can reduce the cost of multiple orders because certain information available at one physician location but not the other. It provides an interactive environment for information exchange, improves the interoperability, facilitates inter-professional communication, and allows for coordinated patient care.

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## Global Opportunities and Challenges

### EHR in Health Care - Opportunities

**Better patient care:** the ability to offer a unified patient medical record containing patient data from all patient encounters across all operators. These records will be available anywhere and anytime allowing healthcare providers to have a comprehensive view of the patient's history and provide the most suitable treatments accordingly. (AbuKhoua, E., at. al 2012).

**Improved Communications:** The growing adoption of EHR holds promise for long term benefits that facilitates easier communication among healthcare professionals at both inter- and intra-institution settings, allows seeking second opinion from remotely located expertise provides easy access to patients' medical and medication history, and improves documentation accuracy and the overall quality of information sharing among healthcare professionals and professionals and public (Seto, B., & Friedman, C. 2012).

**Cost Reduction:** the ability to take advantage of the capabilities of CC and create a collaborative economic environment where the overhead costs are shared among the participants; with the flexibility to only pay for actual resource utilization. This feature is very suitable for small and medium sized healthcare providers where they can utilize advanced IT infrastructures and services to support their healthcare operations without facing high initial and operational costs. Another cost reduction aspect is the savings gained from making medical records available globally, thus there are no costs incurred in exchanging and sharing patients' data around the world. (AbuKhoua, E., at. al 2012).

The organizational outcomes of an EHR implementation focuses on cost reduction, revenue increase, and improved legal and regulatory compliance (Menachemi, N., & Collum, T. H. 2011). Increasing revenue is related to improved billing system as a result of accurate documentation and to close monitoring of cash flow (Erstad, T. L. 2003). The reminder system that is generated by an EHR improves patients' compliance to recall and follow-up visit (Agrawal, A. 2002). Cost reduction is related to ability to access patient's data electronically which eliminates the cost for mailing and faxing (Menachemi, N., & Collum, T. H. 2011).

**Solve the issue of resources scarcity:** the ability to overcome shortages issues in terms of IT infrastructures and health care professionals. This is very important in some areas (such as remote rural communities) with the shortage in primary healthcare facilities (Wootton, R. at. al 2009). The Cloud enables healthcare providers to use remote medical services and data that help in providing primary healthcare in such areas. It also allows various health care specialists to offer their services remotely thus saving time and effort and reducing the need to have experts available everywhere (AbuKhoua, E., at. al 2012).

**Better quality:** the health care operators by having their clinical data stored in the cloud will facilitate supplying concerned entities such as the Ministry of Health or the World Health Organization with information on patient safety and the quality of care provided. The information will be attained by one of two methods; (1) aggregating existing data to arrive at the indicators requested and/or (2) providing on-line ability for health care operators to enter/access data directly. Health care data stored on the Cloud can be aggregated and reported along the lines of generally accepted health care quality indicators such as ones published by the Agency for Healthcare Research and Quality (AHRQ) (Agency for Healthcare Research and Quality). AHRQ quality indicators are accepted worldwide and many health care operators use these indicators as measures of performance. For example, the US government will be rewarding US health care operators in 2012 on their ability to meet quality indicators by increasing the payouts they receive from it. This measure was a byproduct of the American Recovery and Reinvestment Act signed by President Barack H. Obama in 2009 (The US Government Printing Office (GPO). Public Law 111- 5 - American Recovery and Reinvestment Act of 2009). Quality indicators can includes infection rates, lengths of stay

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and readmission percentages. The other method to collect indicators is for the Cloud owner to provide an on-line tool for health care operators to report incidents such as sentinel events or adverse drug reactions. Such data is important and sometimes it may not be available in the operational data that the operators send to the Cloud, hence creating the need to setup specialized tools to gather it and make it available. (AbuKhoua, E., et al 2012).

**Facilitates research activities:** AnEHR can offer an integrated platform to host a huge information repository about millions of patients' cases which can be uniformly and globally accessed. This integrated platform can be easily utilized to develop data mining models to discover new medical facts and to conduct medical research to enhance medications, treatments and healthcare services (AbuKhoua, E., et al 2012).

An EHR facilitates research activities that require that require extraction of clinical data. It also facilitates the consenting process of research subjects because it allows for patient-doctor interaction. The consent form will be electronically stored and subjects can be easily identified if needed urgent care (Hoffman, M. A., & Williams, M. S. 2011). If an EHR is constantly updated, it can provide a rich source to obtain data at both prospective and retrospective manners which constitutes the foundation for a huge longitudinal database that allows researchers to study the risk factors of common diseases, determine the course of the disease, and identify eligible subjects for clinical trials. The utilization of an EHR for research purposes should reduce the drop-out rate and facilitates recalls (Zheng, K., Mei, Q., & Hanauer, D. A. 2011). An EHR is important to monitor epidemic outbreak, endemic and elevate preventive protocols. The outcome of particular medication or regime is best examined through investigating the patients' response. An EHR also is valuable in determining the population attitude toward health practice. The overall pattern of rare diseases can be determined from data extracted from an HER and an EHR is also important for disease surveillance.

Public health researchers are actively utilizing electronic data that had been aggregated across population to address health concerns and establish strategic scheme for prevention and management. Patients' are able to access the results of their laboratory results and receive personalized recommendation (Menachemi, N., & Collum, T. H. (2011).

**Effective and Efficient Management:** The application of an EHR can be improved management of patients' related data, reduced errors and improved the overall quality of health services (Ronquillo, J. G. 2012; Jha, A. K. 2011). The success of EHR and IE systems depends on its recognition of an increasing demand to remain patient-centered and responsive to clinician need (Esquivel, A., et al 2012). The coding system that is used in EHR improves the quality of documentation and increased adherence to treatment guidelines (Delaney, B. C., et al 2012). The decision makers can use the EHR data for planning and budgeting for healthcare services. It can also be integrated with e-Cloud services to help in forecasting future healthcare services needs. This will help for example in planning the needs for doctors, medical labs and equipments, operating rooms, patient beds, and other medical facilities. (AbuKhoua, E., et al 2012).

### **EHR in Health Care - Challenges**

Though, the application of EHR in health care are providing with some of the Global opportunities as discussed above, it also posing some of the challenges. The following are some of the important challenges for application of EHR in health care (AbuKhoua, E.; Najati, H.A, 2012).

**High cost of implementing:**the cost of EHR requires investments in software, hardware, technical infrastructure, IT professionals, and training. This can result in a considerable cost to healthcare organizations in particular for the medium and small sized entities. EHR implementations can be time consuming and stressful for the already stressed healthcare organizations due to demands on healthcare professionals who have to share project responsibilities with their patient care duties. Finally, EHR requires dedicated teams and proper funding to management and maintenance.

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**Confidentiality and Security:** The revolution in EHR is challenged by issues related to security, patients' confidentiality and identification.

**Disintegration of EHR - HIT and insufficient exchange of patient data:** EHR in most cases exists as separate small clinical or administrative systems within different departments of the healthcare provider's organization. Therefore, the patients' data exist in a dispersed state where certain portions of this data are restricted within separate departmental systems, certain clinics or areas of the healthcare organization. Such dispersed pockets of data make it challenging to bring information together and share it across the organization or across different healthcare providers.

**Regulations/laws mandating the use and protection of electronic health care data capture and communication:** The well established laws or regulations requires to mandating the electronic capture of patient data in addition to law covering issues of protection and security of this data. The data protection standards and regulations are at different levels across countries; for example, the directive on privacy and electronic communications in Europe (European Commission. Protecting Your Personal Data) protects the personal information of patients while the Health Insurance Portability and Accountability Act (HIPPA) and Subtitle D of the HIT for Economic and Clinical Health (HITECH) Act in the United State (U.S. Department of Health & Human Services) enforces privacy and security standards for organizations covered by HIPPA.

**Lack of EHR design and development standards:** There are no well established standards available for healthcare providers to use to design and build their systems. This would include definitions of data types, forms and at times frequency of data capture in addition to defining how the data is obtained, stored, used and protected. One of the biggest challenges in the area of e-health standardization is the production of multitudinous e-health standards (e.g., DICOM, ISO/TC 215, HL7, etc.) developed by numerous standardization bodies (e.g., NEMA, ISO, etc.). Many of these are not interoperable or not directly coordinated with each other at an organizational level. More about existing e-health standards is available in the ITU-T technology Watch Report, 2011 (ITU-T Technology Watch Report—Standards and eHealth).

## Conclusion

Although there are many advantages with EMRs and information technology, healthcare has not been able to make use of the potential in the same way as many other industries (John Øvretveit et.al 2007). In particular, implementation experience has been varied and sometimes negative, notably in public health care systems, and where the EHR is part of a larger health information system serving many purposes and connecting different organizations (Hendy J, et.al 2005). One example is the slow progress in the UK: by 2003 3% of NHS hospitals were meeting the target to have an electronic patient record by 2005 (An Information Strategy for the Modern NHS 1998–2005), and the target was put back to 2007.

The application of EHR can improve interoperability between different healthcare institutions, facilitate collaborative research projects, and allow for easier data sharing. The Global application EHR will be providing the opportunities such as better patient care, improved communications among the health services providers, reduced cost, solving the issue of resources scarcity, better quality of services, facilitates the research and also provide the opportunity for the effective and efficient management in the Health care organizations. Though, the application of EHR in health care are providing with some of the Global opportunities, also posing some of the challenges such as High cost of implementing, issues with Confidentiality and Security of the patient data, Disintegration of EHR-HIT and insufficient exchange of patient data, Regulations/laws mandating the use and protection of electronic health care data capture and communication and lack of EHR design and development standards. However, the challenges associated with EHR will be limiting the wide implementation of EHR system until a user-friendly platform that allows for controlled data sharing with maximum security. There is need to develop the operation system-friendly platform that allows for application of EHR at national levels where it controlled by local health authorities and overseen by the Ministry of Health, and afterward at global level.

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