

# ELECTRONIC HEALTH RECORD SYSTEM: CHALLENGES IN IMPLEMENTATION

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This digital world is looking forward to a completely established healthcare system. Electronic Health Record (EHR) systems are the base for this initiative. The developed countries already established the system of EHR. But still, they are facing challenges in the system like interoperability. Developing nations like India are still in progress, but barriers are persisting and one among them is policy and regulations. So, the better establishment of the EHR system in these countries is possible by figuring out the challenges and studying the basic reason behind them. Figuring out the planning and execution of similarly structured countries which are victorious in this field will help to overcome these barriers. This review is focussing on the major challenges faced by countries especially India, which are still progressing with EHR systems and facing certain challenges. And depicts how other countries swamped these barriers.

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## Introduction

The digital world has made a reformation in the healthcare industry also. The major transition is the document-based health care information into the EHR. An electronic health record system (EHR) is electronically stored the health information of a patient in digital format. These are patient-centered records that make information available instantly and securely to authorized users. It can be shared across different healthcare settings by using networks. It helps to increase the quality of care. EHR improves quality by providing doctors and patients better access to test results, identifying missing information, offering evidence-based recommendations, etc. The implementation of EHR makes the health care workflow more structured in case of care-driven, work aspects, and several other factors. But the implementation process is a challenging one. It will differ according to the country's economic criteria, policies, rules and regulations, patient, and staff resistance, etc. European countries are more adaptive to EHR implementation compared with Asian countries. All European countries' adoption rate is more than 90% for the implementation. The Southeast Asian

countries' population, health system, financial and judicial process, and government structure, all are challenges to the implementation of the EHR system in all hospitals, especially in India. Despite thinking about EHR systems in European countries, it is important to note down the factors that have contributed to success as well as the challenges in the implementation in developing countries of the Southeast Asian region.

## Electronic health record system

An electronic health record (EHR) is a standard-based machine-processable information entity consisting of health data pertaining to an individual. It is a result of an exhaustive aggregation of personal health data, which is longitudinal, cross-institutional, and multi-modal. And, more specifically from the definition of the Centre of Medicaid and Medicare Services (CMS), Electronic health records are digital forms of patient records that include patient information such as personal contact information, patient's medical history, allergies, test results, and treatment plans. Data quality and reusability of patient data are well structured with the implementation of an electronic health record system. Researchers and healthcare professionals give life to the health record system by means of technology and digitalization.<sup>1</sup>

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**Keywords:** Electronic health record (EHR) system, Implementation, Challenges, Southeast Asian countries.

EHR and EMR: EHR is a broad term compared with Electronic Medical Records (EMR); EHRs satisfy all the functions of EMR. EMR are digital copies of a patient's paper records, but rather than a patient's medical history, medical data, and treatments provided by a particular provider. EHR contains a comprehensive report on a patient's overall health. An electronic medical record, or EMR, is a computerized version of a chart that contains patient data, but EHR is a computerized repository for medical data. EMRs have a problem sharing records with other healthcare settings including labs, pharmacies, and scanning centers, but EHR is well equipped to overcome this difficulty. EHR is designed to support medical decision-making with various integrated tools. They offer necessary data that can support care coordination among all providers in the healthcare system, hence it is essential to the future of healthcare. EHR software may connect experts for healthcare decision support, provide clinical reminder notifications, and analyze gathered information for both care management and research. It is made to share information with organizations outside of the one that initially gathers and compiles it. EHR has several advantages over EMR that include management of all diagnosis results electronically that ensures no results are duplicated, Prescription order entry, decision support, and patient support. EHR allows patients to arrange their own appointments, staff members can verify insurance eligibility and treatment delays are also get reduced. Population health management is possible by reporting all the details regarding the various programs like the maternal and child tracking system, Tuberculosis control program, etc.

An EHR system has the capacity to transform the paper-based system by using clinical information software and assist providers in delivering high-quality care to patients. The system helps to easily access the computerized records, improve the quality of care and its appropriateness, and reduction in medical errors as clinical outcomes. For improving the quality of care and reduction of healthcare costs, EHR has three important functionalities includes Computerised Physician Order Entry (CPOE), Clinical Decision Support (CDS), and Health Information Exchange (HIE). A computerized physician order entry system helps to enter orders for drugs, laboratory test results, radiology reports, etc into a computerized system. It provides data that are free of medical errors and accurate with accessible quality. The ordering process is more flexible because the data goes to the pharmacy staff and nursing staff are complete and clear. No clarity is needed for the data. The CPOE is connected to the CDS and that result in highly effective and quality care.

Clinical decision support helps the physician to take accurate decision for the patient care. By the CDS, the computer signals the latest information of the drug, adverse effects of the medication, cross reference for the drug allergy, alerts for drug interaction. Since the technology is developed day to day, the newer technology will provide more and more types of CDS. This change will help in efficient method of treatment to be provided for the patient care.

Health Information Exchange (HIE) is the process of sharing electronic health information between organizations and efficient delivery of information of health care. It helps to reduce unnecessary tests and procedures. By HIE, the data stored in one location get access to another clinician's place easily. It reduces the cost of redundant tests. The data of one patient is spread in various locations where they received care. The data from the primary care physician's office, other specialist physician's place, one or more pharmacies, and other departments like emergency departments. It can provide cost-effective and higher-quality care because HIE helps in the exchange of information through an electronic health record system.<sup>2</sup> Automated Health Records (AHR) is a form of EHR, that helps in the collection of images of conventional health record documents stored in the computer.

During the period 1960-1970, the development of technology and the health care systems made a path from traditional paper records to electronic health record systems.<sup>3</sup> The foundation of the electronic health record system not only clarifies the demerits of paper systems but also made drastic progress in the health care system. Introducing an EHR system is a systematic approach and it is done in a stepwise process. The EHR implementation cycle shows the change in management principles and transformation from conventional form to electronic form. This process is difficult while planning, evaluating, and minimizing errors. The implementation takes place after scientific research, quality audit, checking financial status, standardization of records, data reusability, and evaluation of each step process. While checking the satisfaction from the patient end and health care workers, most of them are met. But still, the works are progressing according to the digitalization process. From developed countries to developing countries the process of transformation differs based on technology, finance, data, purpose, and thereby satisfaction.<sup>4</sup>

## **EHR – Challenges in implementation**

There are many factors that affect the adoption as

well as the implementation of even a basic electronic health record system in Southeast Asian countries as well as in European countries. But European countries always trying to solve and accept the challenges resulting in overcoming the barriers and achieving 90% acceptability. And, certain demographic factors are also favourable for them. Southeast Asian countries, including India, have several challenges in implementing the system in different domains of the health sector including the private, public, and corporate sectors.

EHR adoption is encouraged in European countries by the federal government through incentives offered by the HITECH (Health Information Technology for Economic and Clinical Health) Act and CMS (Centre for Medicare and Medicaid Services). In foreign countries, payers and insurance companies are the driving force and they are clear about processes, leading to transparency at each level. Clemens Scott Kruse et al observed that barriers to Electronic Health Record Adoption in the United States are cost, technical concerns and support, implementation, user perceptions, and lack of interoperability established by government agencies. There are a few solutions are also existing to overcome the barriers including making policies and incentives, standardization of data, etc.<sup>5</sup>

India started an initiative for the implementation of EHR in 2013 by the government of India. The national e-health authority was proposed for establishment in 2015 under the Ministry of Health and family welfare (MOH&FW). For the promotion and adoption of e-health standards, the government put a step for the DISHA Act (Digital Health Information in Healthcare Security). This helps to standardize and regulate the process related to the use of digital health data. NITI Aayog 2018 is aim create digital health records for all citizens of India by the year 2022.<sup>6</sup> The Government was setting up an expert committee for the standard implementation purpose and after the review of the committee, MOH has approved the electronic health standards of India. Ayushman Bharat is India's latest initiative toward healthcare delivery with digital including the use of EHR. According to the Online survey conducted to understand the perception among key stakeholders on the current status of EHR in India by Mukul, the Adoption of EHR in the Ayushman Bharat program is a way for the enhancement of collation of data and draw inferences on disease burden.<sup>7</sup>

The four most common challenges for Southeast Asian countries, especially India, include:

- 1) Policy and regulations
- 2) Standards and interoperability

- 3) ICT Infrastructure
- 4) Staff resistance

The paragraphs hereunder describe the challenges and present a likely solution based on the experiences from other geographies.

**1) Policy and regulations:** Patient access to EHR is one of the principals aims of EHR implementation. It helps them for a better understanding of their health condition and treatment. Policies are important because EHR data are related to the privacy and confidentiality of patient information. Different countries have their own laws and policies and procedures for the benefit of patients accessing EHR. The laws are Started implemented by the Law of Health Records in Australia in 1997, it studied information confidentiality and access to the information in health records. And, the country has some organizations like the federal privacy office, agencies of private and public sections, etc as policies or guidelines for protecting the privacy and confidentiality of electronic health data. In Canada, state and federal laws for maintaining patients' privacy and health information. Electronic Documents and Alberta Information Support Law analyze the right of patients to access electronic records as well as confidentiality. New Zealand already considered the law of protecting electronic health care information as a matter of privacy law in 1993 and it is modified as per the development of EHR in the country.<sup>2</sup>

There are guidelines on EMR in India, but earlier, no policy was existing. The hospitals that established the system follow the guidelines, but their focus is more on the patient than EMR. MAX and other hospitals extend from EMR to EHR, but the lack of policy is one of the reasons make its extension.<sup>7</sup> India has no specific data security act for supporting the health sector. India's unique identity card is the Aadhar card, but it is not able for handling patient-sensitive data due to policy and regulatory framework.<sup>8</sup> Security of patient records, misuse of the database, and cybersecurity threats are important concerns and challenges in the implementation of EHR.

Laws and regulations are needed to protect the information shared electronically by the healthcare provider and the confidentiality of the patient data. National health IT policy is also mandatory for ICT infrastructure and interoperability. Inside the software, the use of password-protected data, encryption, and cloud storage can address issues related to security. If we are using the information of patients for decision-making purposes, applicable procedures must be needed under the legislation. A

cloud-based EHR is secure and it makes easy access to patient information from various levels of the healthcare system in public facilities.<sup>9</sup> All stakeholders in hand are the success of any system, in the case of EHR regulations should be made for their responsibilities for active and timely involvement and service delivery.<sup>6</sup> The digital signature is also an important aspect of ensuring the security and integrity of patient data.<sup>9</sup> In the year 2022, the Health Data Management policy is established in India as a part of the Ayushman Bharat Digital Mission for the protection of individual data principals' personal digital health data privacy. This will be helpful for overcoming certain challenging factors that exist in the Indian scenario of EHR implementation.<sup>10</sup>

## **2) Standards and interoperability:**

Interoperability is an architecture of EHR for transferring the information of medical records and healthcare between providers, it allows for complete access, exchange, and use of all accessible electronic health information. According to the Office of the National Coordinator for health information technology (ONC), application interaction with users, system communication, information processing and management, and consumer device integration are considered to be key areas of EHR for making interoperable. In most cases, EHR interoperability is not as effective as it could be.<sup>11</sup>

In the USA, the government created the standards of EHR interoperability for smooth communication among different healthcare systems. The government spent more than 20 dollars on automating medical records and creating a manageable interoperable system. The figured complications are fragmentation among vendors, the larger companies only aimed at specialized or large hospitals, some people will approach large hospitals, and some at small physician practices.<sup>12</sup> Similarly, even though Switzerland has a high-quality health system, interoperability has not been achieved yet. Canada is exceptionally taking efforts for EHR interoperability, Info way's corporate plan 2016-2017 is an example that provided pan-Canadian common standards.

In India, the Ministry of Health & Family Welfare (MoH & FW) notified the EHR standards in the year 2016, it provides information on EHR standards and guidelines with respect to the Indian healthcare system.<sup>6</sup> But still, implementation is a challenging factor. Technical support, as well as an agency, is needed for the regular and timely update of these standards. The use of a unique ID is the best solution for patient identification in interoperable EHR.

Everyone in the country is given a unique health

identification number (UID) under the National Health Mission, which developed the health management information system throughout several states of the nation. Linking this number with Aadhar was proposed, it helps in merging the digital identification number with digital health records. But low and middle-income countries are facing certain challenges due to the bigger data in health care, privacy issues, etc. Using the Aadhaar identification system to link private health information raises concerns about possible privacy violations, data ownership, and use. Majorly, the confidentiality of those whose data has been made available for analysis. Inadequate health data protection regulations along with emerging data protection technologies expose people to critical ethical issues. Strong regulation of EHR is needed in Low middle-income countries like India. As an initiative of getting a digital health ID, the Indian government launched Ayushman Bharat Digital Mission 2021. This digital health ID is a 14-digit unique health identification number that will contain the patient's health records. It will provide reliable data for better treatment and savings for the patient. Interoperability within the digital health ecosystem is a milestone approach for the Indian health system.<sup>13</sup>

According to Shull, the major obstacles to interoperability are cost, coding, semantics, analysis of progress, and privacy issues. Malaffi is a unified health information exchange platform launched in Abu Dhabi to access and share information among 2000 public and private healthcare providers. Similarly, Mijn Gezondheid is implemented in Belgium. These are successful models to make a reference for development as per the Indian government's requirement. Jessica Germaine also mentioned the best practices for effective and interoperable EHR. It includes the adoption of international standards like SNOMED CT, FHIR, LOINC, and starting medical school.<sup>14</sup>

The Indian researchers can make use of these standards and can take applicable points. There should be an integrated work of physicians, other healthcare workers, software developers, programmers, statisticians, and even end-users because each one's need is different in EHR and proper allocation only helps in implementation and interoperability.<sup>14</sup>

All the concepts and ideas implementation are a big challenge in front of the Indian government. To ensure the interoperability of the system, the government should put forward a truthful agency and get into activity after expert checking of applicability in the Indian health system. As a developing country and has a large population it is

very difficult to establish interoperability by adapting models from European countries. We need to promote research and development of the use of EHR in Indian hospitals by an expert team. Because EHR is not completely established in any hospitals, Max health care uses the Vista EHR system and the hospital is also evaluating technologies to make EHR available on doctor's tablets or mobile for better patient care.<sup>15</sup> At the provider level, Tata Memorial Hospital also has implemented EMR and is moving towards EHR. Most of the hospitals in India are working on artificial intelligence to achieve a fully implemented system. But still, interoperability remains a major challenge in the Indian system. Therefore, from starting onwards we can keep in mind the interoperability structure and then work for EHR. It will help in improving both aspects of standards as well as interoperability. The US government is still facing problems with interoperability because of the establishment of differently structured EHR in different hospitals. The qualitative and fast-working research team can fulfil the aspects of EHR in Indian hospitals. Issuing guidelines for the benefit of stakeholders is beneficial for health IT solutions with respect to interoperability.

**3) ICT Infrastructure:** A prerequisite for EHR implementation is ICT infrastructure in place. But the major amount of government hospitals in India, there is a shortage of basic data entry equipment like computers, data storage facilities, etc. This is the first major problem to solve before we take the initiative for EHR implementation. It is mandatory to ensure that all public healthcare facility has ICT equipment and a secure as well as reliable information exchange system. Private facilities also need appropriate ICT equipment to handle many patients. Lack of equipment will affect the readiness for implementation. The use of free and open-source software and personal health record system are important activities of infrastructure development.<sup>9</sup>

Singapore is a well-developed Southeast Asian country with a very good level of ICT penetration, this is the reason for the successful implementation of EHR in the country. This ICT development happened in the clinical, administrative as well as logistic activities of the hospital. The cost of software installation and version updates are the major challenges of ICT infrastructure development, but Singapore is using web-based health information applications which reduces the telecommunication costs and implementation costs. In the case of Malaysia, rapid changes in ICT infrastructure are one of the bigger challenges in the implementation of EHR. The government then takes the initiative in developing ICT infrastructure and its integration by

certain National ICT projects for health including integrated telehealth, tele primary care, and total hospital information system.<sup>16</sup> All European countries are well funded in government as well as private scenarios, and ICT infrastructure is not a challenging factor for the implementation of EHR in European countries. As per the survey, related studies of Maryam Jahanbakhsh et al ICT infrastructure challenges of Isfahan include the cost of hardware and software like in other countries, applied system software weakness, databases for normalizing data, Determining the exact procedures to work on basic layers such as data warehousing or data mining, etc. And the author also provides practical suggestions which are applicable to India also, because similar kind of challenges is faced by the Indian system according to various studies. The suggestions consist that prior to implementing the EHR, there should be a strategic and executive committee for the project and the challenges of infrastructure must be solved before implementation.<sup>17</sup>

Indian scenario is very much different from European and somewhat similar to certain Southeast Asian countries. India has large public healthcare facilities, so the major problem with implementation is the cost of hardware and software. Now the ICT infrastructure of public hospitals is very less, it is observed that only a few public hospitals have computers and connectivity like AIIMS, PGIMER, etc. For these connectivity issues and to manage the expenses, using open-source software systems and the cloud computing environment is a good approach. Privacy and security are also a matter when considering ICT. Therefore, before selecting the ICT infrastructure, we should assure a national secure health net. Efficient delivery of health care information is possible by HIE, these exchange facilities are possible through the partnership with the private sector.<sup>18</sup> When we are converting from paper-based to electronic systems, the basement is the ICT infrastructure. The proper finding of the ICT facilities as per requirements like privacy, security, exchange, interoperability, and management of health records will help to reach a better electronic health record system. This will also help to avoid the extra amount of maintenance work for each functionality. Singapore's initiative for ICT structure will also give meaningful development criteria for ICT in India.

**4) Staff resistance:** The electronic health record system is the most used e-health technology in the health care system. It helps healthcare professionals to manage and improve patient health and care. The implementation as well as for working of the

system is absolutely in the hands of these people. Trained healthcare professionals are an essential factor for this milestone in the healthcare system. They have positive and negative approaches to the system.

The positive approaches include that they will be useful and beneficial, because of enhanced approaches to patient data and health records, enhanced communication process, better decision making, and use of practice guidelines. They must save time on the documentation process as well as paperwork. Reduction in medical errors and improved efficiency.<sup>19</sup> The negative perception is that they have a lack of computer literacy, and skills, fear to use them, and low satisfaction levels. There is a fear that health professionals cannot access medical records if the power fails. With the complexity of technology, more time is required to feed the data. There are possible system errors also. Both positive and negative perceptions may affect the system, but emerging technology always goes with a cost-effective and qualitative approach only. So EHR has a larger impact on patient health and quality of treatment. The professionals are ready to get trained and well-experienced in the system.

**4) Privacy and confidentiality:** Privacy is the claim of the individuals to be let alone and confidentiality is the right of an individual to have personal, identifiable medical information kept out of reach of others, which means respecting patient information. A patient's information should only be disclosed with that person's consent or as required by law. For EHRs to work properly, access to the data is required by healthcare organizations, insurance companies, and other private parties. The Health Insurance Portability and Accountability Act of 1996 (HIPAA) is a federal law that required the creation of national standards to protect sensitive patient health information from being disclosed without the patient's consent or knowledge. If only users have access to data, then confidentiality is being preserved. The administrator recognizes the user, chooses the type of shared information, and gives usernames and passwords. The user should be informed that they are responsible for how the information is used and misused. This will help to assure the people on privacy as well as confidentiality issues. Even though, there is no complete assurance of security breaches. Additional security policies needed to be established in Countries like India for strengthening the of privacy and confidentiality of each individual health data.

## Conclusion

The most common challenges faced by Southeast Asian countries on EHR implementation are policy and regulations, standards and interoperability, ICT infrastructure, and Staff resistance. The learnings from approaches used by other nations, fully functional systems, will aid in finding solutions to the problems these nations are currently facing. Close observations and recommendations from other successful countries will be a chance of establishing a well-developed system.

And the other truthful fact is EHR systems of some developed countries are still facing challenges in certain aspects of the implementation. When we are ready to make the right choices from accomplished methods for the above-mentioned challenges, the corrections will make a fully equipped and acceptable system in the health field. It is better to have a dedicated team for studying and organizing the aspects and implementing an uncontested EHR system. India can overcome the challenges related to policy and regulation through the implementation of the Draft Health Data Management Policy implemented on behalf of the Ayushman Bharat Digital Mission.

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