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EHR Adoption in India: Potential and the Challenges

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Abstract

Background/Objectives: Electronic Health Record are unique electronic documents composed of information like patient history records, demographics, prescribed medications, laboratory reports and computerized tomography etc. to pertaining the patient health care. The main objective of the paper is to review the present adoption rate of EHR in India with respect to global market. **Methods/Statistical Analysis:** EHR is the key component for the clinical decision support system .To review the current scenario of adaption rate of EHR, bibliographic learning was obtained from many hospital sources. In addition, contact was made with EHR vendors. **Findings:** During the pilot study of about seven month, around twenty major hospitals encounters in which successfully the EHR system has been implemented. Globally the adoption rate of EHR in major countries are China (96%), Brazil (92%), France (85%), and Russia (93%) in this respect. In year of 2020, globally Market of electronic health records will place at US$25.98 billion as per the reporting of CAGR. Interoperability standards issues; lack of funds; shortage of suitable governance health policies are the major barriers in adoption of EHR in India. **Application/Improvements:** Adoption and implementation of EHR should be made mandatory in large sized and medium sized hospitals. In upcoming years EHR system require to incorporated a framework of standards, latest tools and consolidation of system providers.

Keywords: Electronic Health Record, FHIR, HL7, Public Health, Security

1. Introduction

Government of India's 'The Digital India Healthcare' initiatives making their way into policy. We believe that the increased utilization of health IT products and its acceptance is one of the key to implement the vision on digital India. Major objective of the new initiative is to encourage health Information technology, for improvement of a digital infrastructure for providers as well as patients so that care can be delivered more effectively and adequately. Indian Government has been considerable interest about the Electronic Health Records (EHR). EHR and EMR are the leading technologies that are primarily used to supervise the patient's health information. However, both are more or less the same with the slight difference being that EMR (Electronic Medical Records) is mostly used by a healthcare organization whereas EHR collects the patient's information from different sources[1]. The EHR is in digital format about a distributed personal health record that provides confined, real-time, patient-centred information includes uuid information (e.g Aadar Card), diagnosis history, lab reports, immunization dates, allergies, and images that are useful for making clinical decision. EHR systems can improve the physician competence and minimise costs, as well as encourage evidence-based medicine[2]. Most prominent feature of an EHR is that, digital record can be modified, formed, and handled by authoritative vendors and staff. With the help of interoperatibility data can be share across more than one health care organization.

In 2013, Ministry of Health and Family Welfare[3] notified EHR standards for India. Some organizations are at the forefront of the curve. From decades, they have been adopted electronic records while rest are still in

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the planning phase. Historically, on basis of the survey, taking up of EHR has been considerably lesser in India as compare to other developed nations. To enhance the acceptance & to influence its returns, the Government of India has budgeted $19.2 billion for HIT. Worldwide[4,5] there is a distinction in adapting of EHR in the health care systems e.g, China (96%), Brazil (92%), France (85%), and Russia (93%), have been noticeably booming in this respect. At present in India, adoption of EHR system is slow, because EHR or EMR is not mandated in India. Motivational benefits of EHR/EMR are:

- Patient information can be securely[6] share anywhere at any time with help of EHR.
- Staff and clinicians can make the direct entry, reduces transcription cost.
- Quality documentation can be maintained (perceptible, readable, records, reports and charts).
- Reduce the issues of prescription of incorrect medicines.
- Complete patient history records improve the cure outcomes.
- These systems greatly aids the physician for immediate patient treatment by capturing the key records.
- EHR records are the key data for implementing the clinical decision support system.

The major barriers in the adoption of EHR are: Interoperability standards issues; lack of funds; shortage of suitable governance health policies. Despite of high concern by the Government of India on adoption of EHR, impetus is still to be recognized. The major Challenge be : Are we keen to initiate the evolution of an "EHR Country"?

Thus, in this study we present, an outline of the existing scenario and challenges for adoption of EHR; the estimated growth of EHR; the roadmap towards significant use of conformity; and provide an overview, that how significant transition should prepare for adaptability of EHR by the organizations.

2. Electronic Health Record Adoption Rate

As per *Healthcare Information and Management Systems Society* Asia Pacific[7], there are eight stages/levels of acceptance of EHR varying from level 0 to level 7. At Stage 0 there is small or nil acceptance while at Stage 7, complete implementation or acceptance. Table 1 list the various stages of model. With reference to the HIMSS analysis adoption model of EHR, by the end of 2016, only 2.6% of hospitals were crossed the Level-6. Up to year of 2020, at stage 7approximate 1.5% of the hospitals of India are measured completely functioning. At stage -7 paperless work will be there to deliver and manage patient care. At present scenario[8,9], a bigger cluster of hospitals (31%) were measured at Level-3. It's a positive sign. However, hospitals cannot realize considerable quality or cost benefits at Stage-3 because still considerable paper based work at this stage. A larger implementation investment requires after Stage-3, a assurance to which very few hospitals have been able to meet. On 4, sept. 2014 Max hospital and on dated 8, dec. 2014 Apollo hospital achieved stage-6 from HIMMS(Asia Pacific). Additionally, exchange of data information among hospitals was

Table 1. Stages of HIMMS[7]

EMR Adoption Model Asia Pacific			
Stages	Cumulative Capabilities	2015 Q3	2015 Q4
Stage 7	Complete EMR, Data Analytics to improve care	0.4%	0.5%
Stage 6	Physician documentation(Templates),Full CDSS, Closed Loop Medication Administration	3.4%	3.9%
Stage 5	Full R-PACS	8.0%	7.4%
Stage 4	CPOE, Clinical Decision Support(Clinical Protocols)	1.7%	1.7%
Stage 3	Nursing/Clinical Documentation, CDSS (error checking), PACS Available Outside Radiology	0.7%	0.6%
Stage 2	CDR, Controlled Medical Vocabulary, CDS, HIE Capable	32.9%	32.7%
Stage 1	Ancillaries-Lab, Rad, Pharmacy-All Installed	4.6%	4.9%
Stage 0	All Three Ancillaries not Installed	48.4%	48.2%

complex because of lacking of interoperability standards among hospitals, which creates the big hurdles among the co-ordination of patient care. These barriers, along with deficiency of regulatory momentum, are the major barriers for industry in adoption of electronic health record widely. By considering these challenge/barrier, Ministry of Health and Family Welfare committee

has recently developed a broader definition for hospitals move to Stage-6 and 7 in future. Despite previous challenges, there are reasons[10,11] for broader implementation of EHR:

(i) EHR technology is the centre of change in healthcare evolution. Electronic health record will grow to be a viable escort for hospitals. The hospitals with slow adoption will be left behind.

(ii) For implementation of electronic health record prompt inducement will assist inhabit up a ample segment of the technology investments. Survival in competitive market will be tough to stay.

(iii) Scope and broader spectrum of EHR, including the exchanging of patient information, firmly to improve the quality care, efficiency and productivity , and ease a better interoperability of patient information across the hospitals. Centralized fully realized EHRs record having which includes the patient's health information: which is absolute, rationalized and precise. It will improved the return of investment and in turn increased adoption rate of EHR.

(iv) Overall inspiration of EHR is, the ability to quickly provide care and to make good decisions. With EHR adoption all benefits will attain all stakeholders in the nation, including, physician, vendors, patients and society as a whole.

In 2013, the Ministry of Health and Family Welfare, notified the strategy for electronic health record which are the guidelines for EHR service providers to make sure that patient digital data become portable and easily redeemable. The market of Indian healthcare, currently invest amount of USD forty Billion in the healthcare industry. For the pharmacies investment is approximately 50%, around 25% for insurance, approximately 15% ford medical equipment and 10% for the diagnostics.

These criteria provide an influential tool with the prospective for remarkable excellence in the area of quality and care. Table 2 depicts the some of the key challenges/barriers to acceptance of EHR.

Table 2. Current barriers in the use of EHR

Current Barriers/ Challenges	Comments
Legacy System	Most of the patient records are paper based documented except few of well known private large scale hospitals. Its a difficult task to convert this paper based record to electronic format.
Cost	High cost of implementation is the foremost barrier. Only hospitals or physicians with high IT budget can afford these systems.
Policy	To promote the implementation of EHR, there is absence of co-ordinated policy of Government. Lack of clarity in the existing policies of HIT.
Funding	Government funding for HIT is almost non-existence. One of the factor leads to lack of adoption of system. Another factor is lack of well trained professional in medical informatics.
Standards	For exchange of information and representation, most of system don't adhere to standards. It will be further complicated, because of multiple local languages used by patients and staff
Computer Literacy	Computer literacy is low among the government staff and private hospitals community. System training is required to properly usage of the EHR.
Co-ordination and Infrastructure	Lack of co-ordination and supporting infrastructure (including the hardware and software) among the public and private sectors hospitals.
Privacy Concerns	Judicial of India has not addressed any specific right of privacy issues with respect to the patient health record. Confidentiality of patient health record is still an open area.

3. Meaningful Use of EHR

Implementation of *Electronic Health Records* (EHRs) is not federally mandated in India, inspite of that we have started discussing about it in India is itself a very good mark. Meaningful Use[12] encourages to migrate from paper charts to digital records while providing the best care to the patients. It improves practice's efficiency, and will give prominent outcomes. The main idea of standards is to build up a system, which would authorize one to generate, pile up, receive or transmit digitally using trustworthy medium for storage of data and transmission. Electronic health record can provide the complete history of patient's health to acquire the right decision. To achieve Meaningful Use, providers must follow a set of criteria that serve as a roadmap for adequately implementing an EHR. On 2014, public remarks on Meaningful use had been projected a range of concerns regarding the requirements of EHR which includes the necessity to improve the earlier culture prior to CPOE[13,14] incomplete order entry systems, and time bound restrictions.

The first logical step in Meaningful Use is to conduct an audit (assessment) of the organization, what is the present status and what efforts are required to comply with goals mention in Meaningful Use. On the basis[15,16] of the audit outcomes, blueprint for an EHR implementation, the required amendments plan can be developed.

Technical aspect used for implementation is based on the specific plan implementation, broader aspects, including the ability to provide interoperability among the other organizations, number of modules to be included etc. For exchange of data among other organization will need to be developed in association with other organizations.

As per our perspective, the industry of healthcare is on the boundary intended for a move where EHR based organization will no longer be an option. In future, for hospitals deliverance through utilize of EHR based system will turn into the default system. As per survey, the hospitals that have adopted EHR systems[17,18] have been perceived as more efficient and consistent. Table 3 shown the list of hospitals which have adopted the EHR system and providers in India. We classify that each EHR vendor will have its own barriers in creation of new scientific and workflow processes[19].

4. Glance of Global EHR Market

According to *Transparency Market Research* (TMR), the industry of healthcare in the middle of a ample move from paper based to digital based, which in turn upshot the enhancement of the EHR[20,21] worldwide. Globally Market of electronic health records will place at US$25.98 billion in the year of 2020 as per report by a CAGR.

Mainly in the United Kingdom and United State, continuous efforts are going on to accelerate this evolution across the whole public and private healthcare network. The United States will remain the largest EHR market in

Table 3. EMR/EHR in India

EHR/EMR Provider	Hospitals Using EMR
IBA Health	AIMS, Coimbatore
Vepro	Apolo Hospital, Chennai
Siemens	Artemis Healthsciences, Gurgaon
Karishma Software	Christian Medical College, Vellore
Sobha Renaissance IT Pvt. Ltd.	Fortis Hospital, Mohali & Dehli
21st Century healthcare solutions	Manipal Hospital, Banglore
Soft link International	Max Devki Devi Hospital, Dehli
Prognosys	P D Hinduja Hospital, Mumbai
Srishti Software	Ruby Hall Clinic, Pune
CDAC	PGIMER, Chandigarh
GE Healthcare	Sri Sathya Institute of Higher Medical Sciences, Bangalore

the Americas and globally as per the report of Accenture. The EHR Incentive Program[22] offering both incentives for compliance and penalties for non-compliance if EHR system not used. In comparison to Asia Pacific, the EHR market of the Middle Eastern , European, and African is supposed to be lead by value of $7 billion approximately. Figure 1 depicted the globally overview of EHR market.

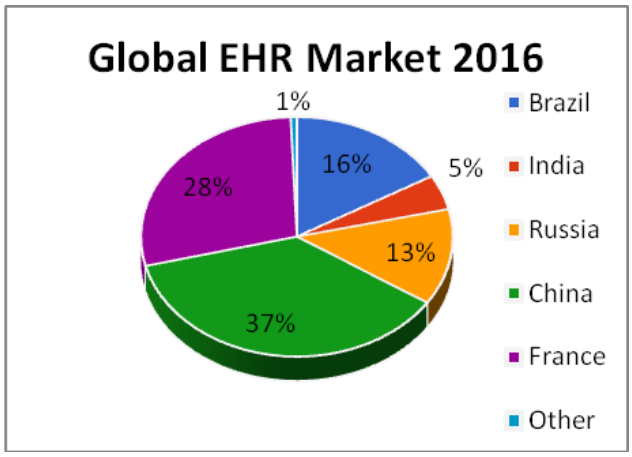

Figure 1. Global EHR market.

Impending markets of France, China, Russian, India and Brazil are anticipated to mature promptly in upcoming year's in EHR markets.

4.1 France EHR Market

In 2000, France established Universal Health Coverage Act, in which every citizens has to access healthcare through this act. This act is applicable for both public and private insurance[23]. In addition, France based *Statutory Health Insurance* competitive system, which ensures the universal coverage of health care. The first computer based health information launched by the Carte Vitale in year 1998. In year 2004, digital medical records prolonged by *Dossier Medical Personnel* . At present, EHR adoption rate is around 72% in France.

4.2 Russian EHR Market

Since 2009 in Russia[24], medical care system mature about ten to fourteen percent with CAGR alongside EHR market. To provide the fast, secure interoperatibilty and exchange of patient information, a large number of EHR vendors started business in Russian market. In year of 2011, nine hospitals successfully adopted EHR .IBM were main suppliers for service using IBM, Lotus Notes. EMIAS launched an EHR system which is division of the digital metropolitan agenda under the government of Moscow. AxiLog, Calystene, Cegedim, Covalia are the major EHR vendors. Some of general parameters, like shortage of monetary incentive along with lack of technical skill are the major challenges for EHR adoption.

4.3 Brazil EHR Market

EHR penetration in brazil considering the implementation from basic level requirements like electronic medicine prescription to the complex one like entire paper less work with the help of different modules of EHR. Brazil has grabbed the 70% market with respect to local health organization[25,26]. Lesser number of EHR providers in the present state. To boost up the adoption trends, HIT providers officering electronic health record as a component module with the HIS. HIT market bearing a 50% to 70% cost of total Hospital Information System (HIS) cost, as the necessities of EHR customization. A large number Educational universities/institutes of country are also developing the modules of EHR. EHR market is predicted to attain $700 million at the end of year 2018, upward at a yearly growth rate of 10.6 %. The major driving force of EHR industry in nation is federal investment of SUS.

4.4 Indian EHR Market

In 2013, Electronic Health Records standards and guidelines for India has been improved and finalized by, Government of India. To uplift the adoption of EHR, various category of standards like Vocabulary Standards ((ICD10, ATC etc.), Content Exchange Standards (HL7,FHIR,CCR and DICOM etc.), Clinical Standards and interoperability(to exchange the records between hospitals) parameters inculcated in documented polices. All these standards are flexible and modified able. On 2015, AIIMS-Delhi successfully implemented the cloud based EHR system to automate the patient appointment and create repository of patient record. For unique identification of patient this system recommended aadhar card number as primary key. Its estimated that HIT market[27,28] will attain $1.45 billion in the year of 2018. It's expected to thrice times more than the $381.3 million crossed in 2012. There is very less diffusion of HIT in India. The total expenditure on IT by the

United State hospitals has approximately cost up to $79-80 billion on comparison to healthcare IT spending payments up to $305 million in India. Major barriers are lack of funding[29,30], computer literacy, scarcity of trained staff, immense initial investments and deficiency of rigid policies.

4.5 Chinese EHR Market

From more than previous ten years EHR industry has been budding across China. Since 2004 a range of alterations have been made in electronic health record scheme. HISPC (Health Information Standards Professional Committee) has improved and finalized the guidelines for EHR standards and specifications. As per the report of Frost & Sullivan in year, 2013, HIT market of China make returns of around $1.24 billion. It is predictable to cross $3.97 billion at the end of year 2020. To refined the HIT[30,31], the strategy of Health China 2020 boost the digitized healthcare delivery. Major international EHR providers are Dell, Fujitsu, IBM while the national providers are Jiangsu Zhongkang DHC, Neusoft, and Yonyou.

5. Conclusion

The Adoption of EHRs will surely boost the competence of healthcare systems but on the other side several parameters like lack of standards, cost, guidance, security and confidentiality, could remain a concern. For well -built healthcare and wider range of benefits of EHRs, the government support to provide incentives act like boosters to promote the market of EHR adoption. The adoption challenges today we are facing are complex and solution to these challenges is not so quick and simple. National policies are required for stability regularity of these problems. We recommended that mandatory in large sized and medium sized hospitals. More innovative approaches like web based and cloud based solution can be used.

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