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Electronic Health Records in India

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Abbreviations

AHR	Automated Health Records
BCC	Bangladesh Computer Council
CPR	Computer-based Patient Record
DISHA	Digital Health Information in Healthcare Security
e-GIF	e-Government Interoperability Framework
eHIE	electronic health information exchange
EHR	Electronic Health Record
EMR	Electronic Medical Record
EMRAM	Electronic Medical Record Adoption Model
ERNET	Education and Research Network
FOSS	Free and Open Source
GoB	Government of Bangladesh
HIMSS	Healthcare Information and Management Systems Society
HISPC	Health Information Standards Professional Committee
ICT	Information and Communications Technology
IT	Information Technology
ITU	International Telecommunication Union
LHR	Lifetime Health Record
MIS	Management Information System
MOH	Ministry of Health
MoH&FW	Ministry of Health & Family Welfare
NeHA	National e-health Authority of India
NITI	National Institution for Transforming India
NKN	National Knowledge Network
PHR	Personal Health Record
SHR	Shared Health Record
SN	Sankara Nethralaya
WHO	World Health Organization

Abstract

The Information and Communications Technology (ICT) seem to diffuse in almost all the sectors. ICT has transformed the way the healthcare data is managed. The widespread usage of electronic devices like computers, tablets, mobile phones along with the availability of high speed internet have made possible the transition from paper based patient records to electronic records.

Electronic Health Records (EHRs) are real time digital version of patient records. An Electronic Health Record (EHR) is a comprehensive report of an individual's overall health. Electronic Health Records (EHRs) help track patient's clinical progress, facilitate improved health care decisions and provide evidence based care.

This is a concept paper based on secondary data from various national and international journals, government documents, government and private websites. This paper presents a review of Electronic Health Records (EHRs) and its use in India. The document gives details of initiatives taken by the government of India in relation to EHRs. Further, the paper discusses the potential benefits of Electronic Health Records (EHRs). International lessons from other countries like China, Bangladesh and Malaysia are also discussed. A brief account of Electronic Medical Record Adoption Model (EMRAM) and private initiatives is also given. Challenges in the way of adoption of Electronic Health Records (EHRs) in India are discussed in detail. Further, this paper presents an outline of roadmap for adoption of Electronic Health Records (EHRs) in India.

Keywords: Electronic Health Records, EHR, Information and Communications Technology, ICT, India

Introduction

Information and Communications Technology (ICT) has created a paradigm shift in the way patient clinical data is captured, stored, used and disseminated. Evidently, there has been a gradual shift from paper based records to electronic records. A number of terms have been used to describe the move from paper based records to electronic records. Some of these terms are: Automated Health Records (AHR), Computer-based Patient Record (CPR), Electronic Medical Record (EMR), and Electronic Health Record (EHR).

Automated Health Records (AHR)

Automated Health Records was the term used for a set of health records stored in the form of images into a computer(World Health Organization and Regional Office for the Western Pacific 2006). This type of health records were used in early 1990's when data was stored in the form of images on optical disk. This helped address problems like those of space and access related to the traditional paper based records.

Computer-based Patient Record (CPR)

The Computer-based Patient Record (CPR) was used to define a collection of health information for a single patient, either for a single episode or for extended period of care and this was linked by a patient identifier(World Health Organization and Regional Office for the Western Pacific 2006). The Computer-based Patient Record (CPR) focused on functions like alerts, orders for medication and providing integrated patient information from various departments like pharmacy, laboratory, radiology etc. However, the exchange of information was limited to inpatient facilities.

Electronic Medical Record (EMR)

The term Electronic Medical Record was used to define an electronic record system used by the general practitioners to record patient clinical information like identification, prescription, laboratory test results etc.(World Health Organization and Regional Office for the Western Pacific 2006).

Electronic Health Record (EHR)

Electronic Health Records were first introduced in 1960s. However, it is in the year 2009 when the "Health Information Technology for Economic and Clinical Health Act" was passed and around $30 billion was allocated for the adoption of the Electronic Health Records and its implementation on a large scale.

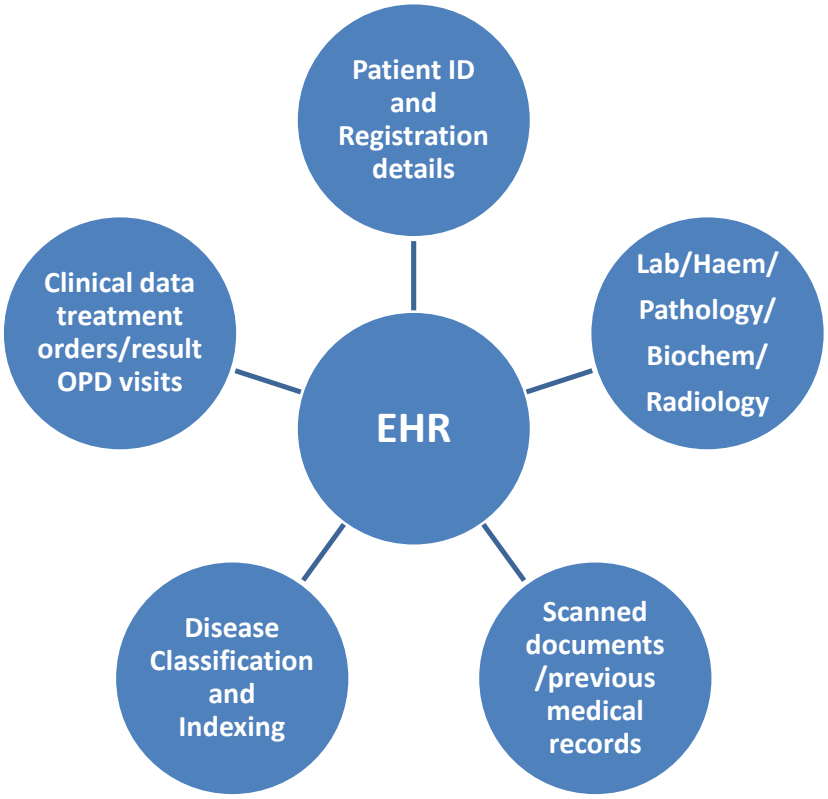
"An Electronic Health Record (EHR) is defined as a collection of various medical records that get generated during any clinical encounter or events"(Vikaspedia 2019). In USA EHR is defined as:

"The electronic health record includes all information contained in a traditional health record including a patient's health profile, behavioural and environmental information. As well as content the EHR also includes the dimension of time, which allows for the inclusion of information

across multiple episodes and providers, which will ultimately evolve into a lifetime record"(World Health Organization and Regional Office for the Western Pacific 2006).

EHR refers to a real time, unique longitudinal health record of a single individual containing his or her entire personal health information including medical details like history, medical examination, diagnosis, laboratory results, allergies, details of immunization, treatment etc. in a digital format. The information is entered electronically by the healthcare providers over the course of his/her lifetime. A simple Electronic Health Record System is shown in the Figure 1(World Health Organization and Regional Office for the Western Pacific 2006). This includes details from some departments within the Institution. Depending on the scope of the EHR system patient details from other departments can also be included.

Figure 1: A Simple Electronic Health Record System



Source: *Electronic Health Records: A Manual for Developing Countries by WHO*

It is important to note that Electronic Health Records differ from Electronic Medical Records. Electronic Medical Record is a digital version of paper record related to patient's medical history recorded in a clinician's office. Electronic Medical Records are not designed to be shared outside

an individual clinical practice. On the other hand, an Electronic Health Record is a comprehensive report of an individual's overall health. Electronic Health Records is a collection of various medical records. It is designed with an intention to be shared outside the healthcare organization. However, some people still use the terms "Electronic Medical Record (EMR)" and "Electronic Health Record (EHR)" interchangeably.

Benefits of EHR

The benefits of EHRs are manifold. Some of them are given in Table1.

Table 1: Benefits of EHR

1	EHRs ensure that patient records are easily accessible from anywhere and at any time
2	EHRs can be stored easily, in less space and for indefinite time
3	Being in electronic format, it reduces the number of records lost
4	EHRs improves the quality of patient records and are cost-effective
5	EHRs help track patient's clinical progress and improve patient compliance
6	EHR gives a summary report of the various clinical encounters in a person's lifetime
7	EHRs help improve the accuracy and speed of diagnosis, and avoid repeating unnecessary tests
8	EHRs can be transferred easily within and across healthcare facilities
9	EHRs are easy to update and can be made available to be used by multiple users at single point of time
10	EHRs allow keeping back up of patient records at a very low cost
11	EHRs facilitate improved health care decisions and provide evidence based care
12	EHRs can be used for research purposes

Initiatives by the Government of India

EHR Standards

The Ministry of Health & Family Welfare (MoH&FW) first came out with standards for Electronic Health Record (EHR) for India in Sept 2013. These were based on the recommendations made by the EMR Standards Committee constituted under the Ministry of Health & Family Welfare (MoH&FW)(Ozair et al. 2015). The document contained recommendations for developing a uniform system for EHRs creation and maintenance by healthcare providers. These standards were revised and were notified in December 2016(Mantri 2016). See Annexure 1 for a quick reference to the MoH&FW EHR Standards Version 2016. List of supporting/complimenting standards is given in Annexure 2.

Goals of EHR Standards

The goals of EHR Standards are enlisted in Table2(Mantri 2016; Vikaspedia 2019).

Table 2: Goals of EHR Standards

1	Promote interoperability and where necessary be specific about certain content exchange and vocabulary standards to establish a path forward toward semantic interoperability
2	Support the evolution and timely maintenance of adopted standards
3	Promote technical innovation using adopted standards
4	Encourage participation and adoption by all vendors and stakeholders
5	Keep implementation costs as low as reasonably possible
6	Consider best practices, experiences, policies and frameworks
7	To the extent possible, adopt standards that are modular and not interdependent.

Need for EHR Standards

- ***Without standards, a lifelong interoperable medical record is hardly interoperable***(Mantri 2016)

Other Initiatives

The following are some of the other steps taken by the Government of India:

- National e-health Authority of India (NeHA) was proposed be set up in the year 2015 under the Ministry of Health & Family Welfare (MoH&FW) with the goal to establish the e-Health ecosystem in India(Ministry of Health and Family Welfare, Government of India 2017). One of the objectives of the NeHA is "To lay down data management, privacy and security policies, guidelines and health records of patients in accordance with statutory provisions"(Ministry of Health and Family Welfare, Government of India 2017). All the objectives of NeHA are outlined in the Annexure 3.
- The Ministry of Health & Family Welfare (MoH&FW) have put forward a draft for the establishment of an Act called Digital Health Information in Healthcare Security (DISHA) of parliament as a statutory body for promotion or adoption of e-Health standards(Bhavaraju 2018). Digital Health Information in Healthcare Security Act (2018) is "An Act to provide for establishment of National and State eHealth Authorities and Health Information Exchanges; to standardize and regulate the processes related to collection, storing, transmission and use of digital health data; and to ensure reliability, data privacy, confidentiality and security of digital health data and such other matters related and incidental thereto"(Ministry of Health & Family Welfare, and Government of India 2018).
- "National Health Stack" a visionary digital framework is proposed by the National Institution for Transforming India (NITI Aayog) with an aim to create digital health records for all the citizens of India by the year 2022(NITI Aayog 2018).

Electronic Medical Record Adoption Model

Electronic Medical Record Adoption Model (EMRAM) was created in the year 2005 by Healthcare Information and Management Systems Society (HIMSS)[1](HIMSS Analytics 2017). EMRAM is an eight stage (0-7) model which measures the level of adoption and utilization of electronic medical record (EMR) functions in any healthcare organization. This tool helps healthcare organizations to measure their progress in EMR adoption compared to other healthcare organizations in the world. Electronic Medical Record Adoption Model (EMRAM) is shown in Table 3. For details see Annexure 4.

Table 3: Electronic Medical Record Adoption Model (EMRAM)

Stage 7	Complete EMR; External HIE; Data Analytics, Governance, Disaster Recovery, Privacy And Security
Stage 6	Technology Enabled Medication, Blood Products, And Human Milk Administration; Risk Reporting; Full CDS
Stage 5	Physician Documentation Using Structured Templates; Intrusion/ Device Protection
Stage 4	CPOE With CDS; Nursing And Allied Health Documentation; Basic Business Continuity
Stage 3	Nursing And Allied Health Documentation; EMAR; Role-Based Security
Stage 2	CDR; Internal Interoperability; Basic Security
Stage 1	Ancillaries - Laboratory, Pharmacy, And Radiology/ Cardiology Information Systems; PACS; Digital Non-DICOM Image Management
Stage 0	All Three Ancillaries (Laboratory, Pharmacy, And Radiology) Not Installed

Private Sector Initiatives

Electronic Health Records have been implemented by some of the private hospitals in India. Max Healthcare initiated adoption of EHRs in the year 2009 and has achieved Stage 6 level of EMR adoption model. Max Healthcare in East Wing and West Wing, Saket in New Delhi achieved recognition award for this in the year 2012(Srivastava 2016). Apollo group of Hospitals have also implemented EHR and have achieved stage 6 in four hospitals located in Chennai, Aynambakkam, Nandanam, and Jubilee Hills in Hyderabad(Srivastava 2016). Other Hospitals like Sankara Nethralaya (SN), Fortis etc. have also implemented EHRs. Though, private sector hospitals seem to adopt EHRs system, but the information is hardly exchanged between hospitals.

Challenges

The development and implementation of EHRs involve lots of challenges. It requires adequate funding, sufficient and well trained manpower including experts from different areas like doctors,

[1] HIMSS Analytics® is a global healthcare IT market intelligence, research and standards organization assisting clientele in both healthcare delivery and healthcare technology solutions business development to make lasting improvements in efficiency and performance.

IT experts, health consultants, educators etc. Keeping patient records secure is one of the key challenges in the implementation of EHRs. There are concerns related to the misuse of the database and threat to the cyber-security. In order to ensure the privacy and confidentiality of the patient's record, access to data should be given only to the authorized users. Some of the measures like password protected data, cloud storage and encryption can address issues related to security of the EHRs. For data integrity, security measures like antivirus software, firewalls etc. should be incorporated in use.

Designing a user friendly interface is another challenging task. Poorly designed interface may lead to reduced time efficiency, poor quality of health care delivery and can become a threat to the patient's safety as well. Acceptance of EHR by the doctors is also perceived as a barrier. This is due to the extra time that doctor spends in entering data electronically which otherwise they can spend in treating the patients. The idea of introducing accountability by the use of EHRs, financial and administrative liabilities are some of the other things being resisted by the doctors.

Theft of Medical Identity is also becoming a growing concern. A person may access and use someone else identifiable information illegally to get the medical services for the ailment. Lack of computer literacy among the healthcare professionals, lack of uniformity in the EHR Software, infrastructural demands, lack of synergy among the health care providers to use the EHR system, poor management practices, lack of awareness of protocols related to security of health information, lack of common understanding between the software development team and the healthcare team, communication silos within the healthcare system, and electronic monitor of data not being a mandatory requirement are some of the other challenges in the way of successful deployment of EHRs in India.

International Lessons

EHR and EMR in China

Though regional EHR systems began to develop in China in the year 2002, the major efforts started in the year 2005(Gao et al. 2013). In 2005, the 16th Communist Party Central Committee made recommendation for the 11th Five-Year Plan12, directing the establishment of EHR and EMR systems in the country. In 2006, Health Information Standards Professional Committee (HISPC) was established under the Ministry of Health (MOH), China for creating standards related to EHR and EMR. In 2009, MOH, China published first series of standards and specifications related to Health Records. By the year 2011, 120 EHR systems were successfully established across the country. For the establishment of EHR and EMR systems, China learnt from the experiences of United States and Australia. China adopted US HL7 Standard for the establishment of EMR systems. To establish a national EHR System, China follows Australia's three stage approach (pilot stage, regional EHR systems, National EHR system). "The Minister of MOH declared on Feb 27, 2012 that 900 million residents had created their health records, accounting for 66% of the national population, and more than 50% of residents had created their ehealth records"(Gao et al. 2013). In the year 2014, 50% tertiary hospitals, 30% Community Health

Centres in Urban areas and 20% hospitals in rural areas successfully established their own EHR system in China(Parikh 2015). It is expected that by the year 2020, 80% tertiary hospitals, 50% Community Health Centres in Urban areas and 50% hospitals in rural areas would established their own EHR system in China(Parikh 2015). Governments at all the levels in China are working on sharing data and clinical services among communities which are geographically dispersed through Regional Healthcare Information Networks (RHINs) by utilizing data centres and telecommunication networks. Efforts are under way to link EMR Systems with EHR systems through Health Cards.

Establishment of Bangladesh National Enterprise Architecture

To realize the vision and mission of establishing "Digital Bangladesh" by the year 2021 through establishment of transparent, efficient and citizen centric public services, termed as "e-services" through ICT, "National Enterprise Architecture" and "e-Government Interoperability Framework (e-GIF)" has been one of the key projects undertaken by the Government of Bangladesh (GoB)(International Telecommunication Union (ITU) 2016). The project objective was to develop systems, structures, technologies, strategies and provide an enabling environment across the Government via improved management of asset, increased interoperability and reduced risks and procurement costs. The goal of the system is to improve the quality of service delivery by health care providers. The rural citizens, who form majority (around 76%) of the Bangladesh' population were first to be included in the system(Zishan et al. 2019). The project initiated in the year 2014 and was completed by the year 2016. It was implemented by the Bangladesh Computer Council (BCC), an apex body of the GoB. The government of Bangladesh uses three types of softwares, namely DHIS-2 for public health services through health facilities all over the country, OpenMRS for hospital services and HRM for human resource management(Additional Director General and Director of Management Information System (MIS), DGHS 2015). The government plans to develop electronic shared health records (SHR) systems which will integrate DHIS-2, OpenMRS and HRM in national level eHealth enterprise architecture (eHEA), to exchange data via eHIE (electronic health information exchange)(Additional Director General and Director of Management Information System (MIS), DGHS 2015).

Lifetime Health Record in Malaysia

Lifetime Health Record (LHR) and Services is an initiative by the Government of Malaysia(Zishan et al. 2019). Under this plan, records for each individual will be maintained throughout his life time, starting from the time of his/her first consultation with the service provider until each time he/she visits the service provider.

Components & Activities involved in EHR adoption

Srivastava in his paper on "Adoption of Electronic Health Records: A Roadmap for India" clearly outlines four key components that are needed to adopt EHR at the national level (Srivastava 2016). Table 4 enlist these components and the underlying activities in each.

Table 4 : Components and Activities involved in EHR adoption

S.No.	Component	Activities
1	ICT Infrastructure	Creation of basic ICT Infrastructure
		Creation of national secure health net
		Creation of storage and exchange infrastructure
		Use of free and open source software
		Use of personal health record system
2	Policy & regulations	National Health IT Policy
		Protection of Privacy
		Sharing of health information
		Use of health information
		Liability of technical failures
3	Standards & interoperability	Establishment of agency for health IT standards
		Use of unique patient identity
		Conformation of testing facility
		Support for adoption of standards
		Guidelines for health IT solutions
4	Research, development & education	Research & development in health IT
		Human resource development
		Development of online courseware
		Dissemination of best practices
		International collaboration

ICT Infrastructure

In order to establish EHR system at the national level, the first pre-requisite is to have appropriate ICT infrastructure in place. At present, only major hospitals in India have ICT infrastructure for the delivery of healthcare services. It is needed that all the public healthcare facilities across the nation have basic ICT equipments in place. Also, to ensure that information exchange is secure and reliable, appropriate communication networks should be established using the existing ones like NKN, ERNET etc. Further, it is required to take an approach of establishing free and open source (FOSS) EMR system. This will ensure that private healthcare facilities which handle a huge burden of patients can provide relevant inputs and support. Also, establishing a personal health record (PHR) system can facilitate easy adoption of EHR. PHR system will help doctors an easy access to the basic patient information like demographics, medical history etc.

Policy & regulations

A National Health IT policy needs to be formulated which will ensure that efforts are not duplicated and systems are interoperable. Regulations to protect the confidentiality of the patient data are also needed. Laws are required to ensure that information shared electronically by the healthcare providers is in the interest of patients. A well-defined procedure must be defined under the legislation to use the clinical information of the patients for decision making purposes. Regulations should define the responsibilities of all the stakeholders involved to ensure

timely delivery of services. This will also help in addressing liabilities in case of technical issues and failure.

Standards & interoperability

Though the Ministry of Health & Family Welfare (MoH&FW) has put forward the EHR standards, but there is a need of an agency to regularly update these standards and to extend necessary technical support needed for its implementation. It is recommended to use unique ID like Aadhaar number for each patient's identification and for tracking his/her clinical progress. The government should put forward an agency to verify and ensure that the IT solutions developed are interoperable. Guidelines should be developed for providing solutions in cases where it is not possible to follow the EHR standards.

Research, development & education

Research & Development related to use of EHRs should be promoted. This is needed to continuously improve the quality of EHRs, reduce its deployment cost and also to facilitate innovations. A well trained human resource in the field of Health IT should be prepared. Developing e-courses to facilitate learning related to EHRs will be helpful. An agency is needed to collect and share information related to EHRs. Further, International collaborations and their expertise can be useful for the deployment of EHRs in India.

Conclusion

To conclude, the development and implementation of Electronic Health Records in India are still in the fragmented stages. It is important to focus on following broad issues if this initiative have to succeed on scale: 1) proper training of doctors and other healthcare professionals to use EHR effectively; 2) a much higher level of public-private partnerships is needed; 3) appropriate ICT infrastructure should be in place; 4) working towards standardizing EHRs; 5) a National Health IT policy needs to be formulated; 6) an efficient management structure to deploy EHR should be in place; 7) efforts should be made to sensitize healthcare workers related to the importance of EHRs; 8) synergy between software development team and healthcare delivery team is required; 9) incorporating voice-based and writing based inputs into the EHR System should be explored; and 10) research & development related to the use of EHRs should be promoted.

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Annexures

Annexure 1: Standards at a Glance

S.No.	Type	Standard Name	Intended Purpose
1	Identification & Demographics	ISO/TS 22220:2011 Health Informatics – Identification of Subjects of Health Care	Basic identity details of patient
2		MDDS – Demographic (Person Identification and Land Region Codification) version 1.1	Complete demographic for interoperability with E-Governance systems
3	Patient Identifiers	UIDAI Aadhaar	Preferable identifier where available
4		Local Identifier	Identifier given within institution / clinic /lab
5		Government Issued Photo Identity Card Number	Identifier used in conjunction with local in absence of Aadhaar
6	Architecture Requirements	ISO 18308:2011 Health Informatics – Requirements for an Electronic Health Record Architecture	System architectural Requirements

7	Functional Requirements	ISO/HL7 10781:2015 Health Informatics - HL7 Electronic Health Records-System Functional Model Release 2 (EHR FM)	System functional requirements
8	Reference Model and Composition	ISO 13940 Health informatics - System of Concepts to Support Continuity of Care	Concepts for care, actors, activities, processes, etc.
9		ISO 13606 Health informatics - Electronic Health Record Communication (Part 1 through 3)	Information model architecture and communication
10		openEHR Foundation Models Release 1.0.2	Structural definition and composition
11	Terminology	SNOMED Clinical Terms (SNOMED CT)	Primary terminology
12	Coding System	Logical Observation Identifiers Names and Codes (LOINC)	Test, measurement, observations
13		WHO Family of International Classifications (WHOFIC) including ICD, ICF, ICHI, ICD-O	Classification and reporting
14	Imaging	Digital Imaging and Communications in Medicine (DICOM) PS3.0-2015	Image, waveform, audio/video
15	Scanned or Captured Records	JPEG lossy (or lossless) with size and resolution not less than 1024px x 768px at 300dpi	Image capture format
16		ISO/IEC 14496 - Coding of Audio-Visual Objects	Audio/Video capture format
17		ISO 19005-2 Document Management – Electronic Document File Format for Long-Term Preservation - Part 2: Use of ISO 32000-1 (PDF/A-2)	Scanned documents format
18	Data Exchange	ANSI/HL7 V2.8.2-2015 HL7 Standard Version 2.8.2 - An Application Protocol for Electronic Data Exchange in Healthcare Environments	Event/Message exchange

19		ASTM/HL7 CCD Release 1 (basis standard ISO/HL7 27932:2009)	Summary Records exchange
20		ISO 13606-5:2010 Health informatics – Electronic Health Record Communication - Part 5: Interface Specification	EHR archetypes exchange [Also, refer to openEHR Service Model specification]
21		DICOM PS3.0-2015 (using DIMSE services & Part-10 media/files)	Imaging/Waveform Exchange
22	Other Relevant Standards	Bureau of Indian Standards and its MHD-17 Committee	Standards Development Organizations (SDOs)
23		ISO TC 215 set of standards	
24		IEEE/NEMA/CE standards for physical systems and interfaces	
25	Discharge/ Treatment Summary	Medical Council of India (MCI) under regulation 3.1 of Ethics	Composition as prescribed
26	E-Prescription	Pharmacy Practice Regulations, 2015 Notification No. 14-148/ 2012- PCI as specified by Pharmacy Council of India	Composition as prescribed
27	Personal Healthcare and medical Device Interface	IEEE 11073 health informatics standards and related ISO standards for medical devices	Device interfacing
28	Data Privacy and Security	ISO/TS 14441:2013 Health Informatics – Security & Privacy Requirements of EHR Systems for Use in Conformity Assessment	Basis security and privacy requirements
29	Information Security Management	ISO/DIS 27799 Health informatics – Information Security Management in Health using ISO/IEC 27002	Overall information security management
30	Privilege Management	ISO 22600:2014 Health informatics – Privilege Management and Access Control (Part 1 through 3)	Access control

	and Access Control		
31	Audit Trail and Logs	ISO 27789:2013 Health informatics - Audit trails for Electronic Health Records	Audit trail
32	Data Integrity	Secure Hash Algorithm (SHA) used must be SHA-256 or higher	Data Hashing
33	Data Encryption	Minimum 256-bits key length	Encryption key
34		HTTPS, SSL v3.0, and TLS v1.2	Encrypted connection
35	Digital Certificate	ISO 17090 Health informatics - Public Key Infrastructure (Part 1 through 5)	Digital certificates use and management

Annexure 2: List of Supporting / Complimenting Standards

S.No.	Standard	Description
1	ISO 12967:2009	Health Informatics - Service Architecture (Parts 1 - 3)
2	ISO 13972:2015	Health Informatics - Detailed Clinical Models, Characteristics and Processes
3	ISO 20301:2014	Health Informatics - Health Cards - General Characteristics
4	ISO 21090:2011	Health Informatics - Harmonized Data Types for Information Interchange
5	ISO 8601:2004	Data elements and Interchange Formats - Information Interchange -Representation of Dates and Times
6	ISO 13119:2012	Health Informatics - Clinical Knowledge Resources - Metadata
7	ISO 22857:2013	Health Informatics – Guidelines on Data Protection to Facilitate Trans-Border Flows of Personal Health Data
8	ISO 21549-1:2013	Health Informatics — Patient Healthcard Data — Part 1: General Structure
9	ISO TS 14265:2011	Classification of Purposes for Processing Personal Health Information
10	ISO TS 27527:2010	Health Informatics – Provider Identification

Annexure 3: Objectives of National eHealth Authority (NeHA)

S.No.	Objectives
1	To formulate “National eHealth Policy and Strategy” for coordinated eHealth adoption in the country

2	To oversee orderly evolution of eHealth initiatives (state and nationwide) and to guide adoption of eHealth at various levels and in different geographical and health system areas
3	To promote setting up of state health records repositories and health information exchanges (HIEs) to facilitate interoperability
4	To formulate and manage all health informatics standards for India
5	To lay down data management, privacy and security policies, guidelines and health records of patients in accordance with statutory provisions
6	To enforce the laws and regulations relating to the privacy, confidentiality, and security of the patient's health information and records
7	To coordinate efforts across departments and ministries, and liaise with other related policy/regulatory groups to ensure consistency and coherence
8	To help enable ecosystem that involves stakeholders to improve care delivery and health outcomes
9	To map continuous evolution of the eHealth landscape and take on new functions as needed

Annexure 4: Electronic Medical Record Adoption Model (EMRAM)

Stage 7	Complete EMR; External HIE; Data Analytics, Governance, Disaster Recovery, Privacy And Security	The hospital no longer uses paper charts to deliver and manage patient care and has a mixture of discrete data, document images, and medical images within its EMR environment.
		Data warehousing is being used to analyze patterns of clinical data to improve quality of care, patient safety, and care delivery efficiency.
		Clinical information can be readily shared via standardized electronic transactions (i.e., CCD) with all entities that are authorized to treat the patient, or a health information exchange (i.e., other non-associated hospitals, outpatient clinics, sub-acute environments, employers, payers and patients in a data sharing environment).
		The hospital demonstrates summary data continuity for all hospital services (e.g., inpatient, outpatient, ED, and with any owned or managed outpatient clinics).
		Physician documentation and CPOE has reached 90% (excluding the ED), and the closed-loop processes have reached 95% (excluding the ED).

Stage 6	Technology Enabled Medication, Blood Products, And Human Milk Administration; Risk Reporting; Full CDS	Technology is used to achieve a closed-loop process for administering medications, blood products, and human milk, and for blood specimen collection and tracking. These closed-loop processes are fully implemented in 50 percent of the hospital. Capability must be in use in the ED, but ED is excluded from 50% rule.
		The eMAR and technology in use are implemented and integrated with CPOE, pharmacy, and laboratory systems to maximize safe point-of-care processes and results.
		A more advanced level of CDS provides for the “five rights” of medication administration and other 'rights' for blood product, and human milk administrations and blood specimen processing.
		At least one example of a more advanced level of CDS provides guidance triggered by physician documentation related to protocols and outcomes in the form of variance and compliance alerts (e.g., VTE risk assessment triggers the appropriate VTE protocol recommendation).
		Mobile/portable device security policy and practices are applied to user-owned devices. Hospital conducts annual security risk assessments and report is provided to a governing authority for action.
Stage 5	Physician Documentation Using Structured Templates; Intrusion/ Device Protection	Full physician documentation (e.g., progress notes, consult notes, discharge summaries, problem/diagnosis list, etc.) with structured templates and discrete data is implemented for at least 50 percent of the hospital. Capability must be in use in the ED, but ED is excluded from 50% rule.
		Hospital can track and report on the timeliness of nurse order/task completion.
		Intrusion prevention system is in use to not only detect possible intrusions, but also prevent intrusions. Hospital-owned portable devices are recognized and properly authorized to operate on the network, and can be wiped remotely if lost or stolen.

Stage 4	CPOE With CDS; Nursing And Allied Health Documentation; Basic Business Continuity	50 percent of all medical orders are placed using Computerized Practitioner Order Entry (CPOE) by any clinician licensed to create orders. CPOE is supported by a clinical decision support (CDS) rules engine for rudimentary conflict checking, and orders are added to the nursing and CDR environment.
		CPOE is in use in the Emergency Department, but not counted in the 50% rule.
		Nursing/allied health professional documentation has reached 90% (excluding the ED).
		Where publicly available, clinicians have access to a national or regional patient database to support decision making (e.g., medications, images, immunizations, lab results, etc.).
		During EMR downtimes, clinicians have access to patient allergies, problem/ diagnosis list, medications, and lab results. Network intrusion detection system in place to detect possible network intrusions.
		Nurses are supported by a second level of CDS capabilities related to evidence-based medicine protocols (e.g., risk assessment scores trigger recommended nursing tasks).
Stage 3	Nursing And Allied Health Documentation; EMAR; Role-Based Security	50 percent of nursing/allied health professional documentation (e.g., vital signs, flowsheets, nursing notes, nursing tasks, care plans) is implemented and integrated with the CDR (hospital defines formula).
		Capability must be in use in the ED, but ED is excluded from 50% rule. The Electronic Medication Administration Record application (eMAR) is implemented.
		Role-based access control (RBAC) is implemented.
Stage 2	CDR; Internal Interoperability; Basic Security	Major ancillary clinical systems are enabled with internal interoperability feeding data to a single clinical data repository (CDR) or fully integrated data stores that provide seamless clinician access from a single user interface for reviewing all orders, results, and radiology and cardiology images.

		The CDR/data stores contain a controlled medical vocabulary and order verification is supported by a clinical decision support (CDS) rules engine for rudimentary conflict checking.
		Information from document imaging systems may be linked to the CDR at this stage
		Basic security policies and capabilities addressing physical access, acceptable use, mobile security, encryption, antivirus/anti-malware, and data destruction.
Stage 1	Ancillaries - Laboratory, Pharmacy, And Radiology/ Cardiology Information Systems; PACS; Digital Non-DICOM Image Management	All three major ancillary clinical systems are installed (i.e., pharmacy, laboratory, and radiology).
		A full complement of radiology and cardiology PACS systems provides medical images to physicians via an intranet and displaces all film-based images. Patient-centric storage of non-DICOM images is also available.
Stage 0	All Three Ancillaries Not Installed	The organization has not installed all of the three key ancillary department systems (laboratory, pharmacy, and radiology).