

# Adoption of Information System by Indian Hospitals; Challenges and Roadmap

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**Abstract**— With the introduction of HIS in hospitals, there has been considerable improvement in quality and standard of patient care being provided by hospitals. Information systems have also been helpful in efficient hospital management. There are innumerable other benefits such as ease in collection and retrieval of accurate and complete medical information of patients, lower operational and treatment costs, less time to retrieve patient medical data, easier interpretation of clinical data and availability of warnings for exceptional medical cases, such as, drug to drug interaction and other safety and interaction alerts, faster return on investment, lesser pilferage and revenue leak incidences etc.

At a time when hospitals are under intense pressure to improve the quality of patient care and patient safety; hold down costs and also adapt to new technological innovations, with the use of Information Systems, they can grow organically with increasing measures of patient satisfaction and financial stability. By adoption of Information Technology to its fullest, a hospital can still be focused on delivering excellence in patient care and achieving improved patient experience in terms of quality and satisfaction; at reduced costs and while still making profits. More and more Indian hospitals both government and private in nature, irrespective of their size, specialty or vision must adopt information systems and technology and reap the benefits that it has to offer. This is the only inevitable way for healthcare delivery system in India in years to come.

**Index Terms** — Medical Care, Indian System of Medicine, Hospital Information System, HIS, Indian Healthcare System, Interoperability, Healthcare Standards, Information Systems, AADHAR, UID, Healthcare Standards.

## 1 INTRODUCTION

### 1.1 INDIAN HEALTHCARE SYSTEM

Foundation of medical care in India can be traced back in Indian history from the times of Buddha and Ashoka and that of Sushruta and Charaka. India could boast of a very well organized hospital and medical care system even in ancient times. Indian system of Medicine was taught in the ancient University of Taxilla. Since then, healthcare in our country developed at a very slow pace contrasting to the rapid growth of population and disease trends. Ratio of hospital beds with respect to population and availability of sufficient health care centers was always way behind expectation and requirement. Though rural as well as urban healthcare experienced a significant improvement in terms of quality of care provided, availability of medical facilities and trained medical staff etc., modern healthcare experienced privatization, liberalization and globalization. Paid medical care became more prevalent and modern hospitals came into being.

Today, we are in a time when global tourism is the much talked about subject. Modern Indian hospitals attract global medical tourists from far and wide to visit our country for medical treatment of complex clinical conditions. Not only do the Indian hospitals have to maintain competitive pricing for services provided, but they also have to provide medical care of International quality. Like all other sectors, healthcare in India also took to computerization of its healthcare facilities. Rural healthcare is also expanding its spread to the grass root

level in the meanwhile and more and more state governments are adopting small to large scale computerization.

### 1.2 HOSPITAL INFORMATION SYSTEM (HIS)

Today's Indian hospitals are adopting computer systems commonly known as Hospital Information System (HIS) for automation of its departments and move from paper based records to computer based records for departments as well as patients. Hospital Information System (HIS) can be defined as a 'comprehensive and integrated information system designed to manage the Administrative, Financial, and Clinical (EPR) aspects of a hospital'. A HIS is a 'computerized system that is developed to meet all the information needs within a hospital. This includes diverse data types such as patient information, billing, finance and accounting, staffing and scheduling, pharmacy ordering, prescription handling, supplies, inventory, maintenance and orders management, diagnostic reports related to laboratory, radiology and patient monitoring as well as providing decision support'. HIS is also defined as a 'computer system designed to ease the management of all the hospital's medical and administrative information and to improve the quality of healthcare' (Degoulet and Fieschi, 1997). Another definition of HIS is given as 'the applications that support the healthcare professionals or patients direct access to order entry systems, medical record systems, patient information systems' and so on (Ash et al., 2003).

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## 2. HOSPITAL INFORMATION SYSTEM (HIS)

### 2.1 History of Adoption in India

According to Weitekamp (1997), 'the use of information systems has become vital for the hospitals of today with a purpose to automate core processes of healthcare delivery, minimize data inaccuracy and redundancy of data collection, connect and support caregivers and clinical decision making with structured evidence based knowledge, improve health outcome, reduce medical error and lower cost.'

A lot of hospitals in India are still rooted in traditional manual processes and are unable to cope up with the large volumes of data being generated. IT has been a late entrant in the field of hospital administration and most hospitals, which forayed into this area started with small systems that were developed in-house. Most first generation HISs of 1960s and early 1970s did not succeed to match the hospitals needs for automation. The second generation of hospital information systems, which started in middle of 1970s and ended at the end of 1970's, mainly served as financial systems and their main purpose was to transmit information from end users to financial systems. They did not save any patient related information but were used only to store and retrieve financial information. Third generation of HIS's, which started in the late 1970's was influenced by database technology, which was introduced in early 1980s and focused on patient care planning and departmental solutions such as laboratory and pharmacy.

Till the middle 1990's, no standardized solutions were available and these local innovations were the pioneers. However, they neither gave the desired results nor could they be integrated with newer systems. The major demand for updated solution started with the establishment of the large corporate hospitals many of which implemented strong IT solutions in the latter half of the nineties. With the increasing demands of the market, several HIS solutions were developed by the major IT companies.

### 2.2 Reasons for Adoption by Hospitals

Today, the healthcare segment is, in fact, going through the kind of evolution that the banking and financial services sector went through a decade ago. This is being also driven by the huge annual increase in the number of hospital beds mostly in the corporate sector in India and the huge amount of clinical, administrative and financial data being generated. Also, the cost of providing high quality patient care services and patient satisfaction in hospitals has increased tremendously in the recent past with the growing need to remain highly competitive in terms of international quality patient care, pricing and value-for-money services. Automation seems to be the only solution that can help hospitals to meet the challenges of modern health care delivery.

Another vital perspective for the need of automation in the hospital sector is the management of patient medical records. In the larger hospitals, patient medical records remain difficult to retrieve; given the huge rush at the out-patient departments

(OPD) at all times, numbering, filing, indexing remains a tedious and error-prone job, if it is manually managed. Storage and preservation of medical records has its own challenges. Huge clinical data is prone to fall prey to rodents and pests, fire, loss of legibility with age, inaccessibility when needed. Doing medical research and study based on patient medical data remains a tedious job. Insurance companies, third party administrators (TPA) and companies rely hugely on these medical records with reference to the International Classification of Disease (ICD) for classification for settlement of patient dues and reimbursements. This codification is done by the medical records department, where a human resource manually searches patient medical file after patient discharge for the discharge notes and the disease, and gives an ICD code to the patient file for indexing, archival and retrieval later. With automated systems, ICD codification and all the other patient clinical data gets generated progressively across patient's clinical journey in the hospital at every point of care.

Hospitals are guided and governed by several statutory bodies and accreditation boards. This requires the hospitals to function according to standard process flows, and documents to be maintained in pre-defined format. During the course of implementation of an HIS system, the hospital processes are streamlined, as an organization wide business process reengineering (BPR) exercise. Since this involves a lot of vital data to be captured in automated systems in accordance with a particular process flow, it helps in complying to the international standards and accreditation requirements of Joint Commission International (JCI), the Joint Commission on Accreditation of Health Care Organizations (JCAHO), National Accreditation Board for Hospitals and Healthcare Providers (NABH), which is an institutional member of International Society for Quality in Health Care (ISQua); ISO 9001:2000, National Accreditation Board for Testing and Calibration Laboratories (NABL), and Central Drugs Standard Control Organization (CDSCO) of the Directorate General of Health Services, MOHFW, Government of India.

Hospital Information System (HIS) also help in managing the workflow processes across the healthcare enterprise and provides hospitals with the tools to ensure compliance to processes and transactional efficiency related to clinical functions. These software solutions help in controlling costs and optimizing efficiencies while leveraging technology to meet patient demands and build more successful healthcare practices.

### 2.3 Components of a Typical HIS

A HIS computerizes principal operations like administrative, clinical and financial functions in a hospital. It is a modularly designed system enabling computerization in phases. Even though different HIS vendors may group and sub-group HIS modules in different ways, the HIS may be grouped into suites or set of modules, with features and modules within them.

The modern HIS automates the patient walkthrough in the hospital right from patient registration to patient discharge with module suites (set of sub-modules) like patient administration, clinical, clinical support, materials management, and revenue management suites depending on the core depart-

ment functions it computerizes. There may be miscellaneous modules and tools like the screen designer, reports designer, and statistical analyzer for presenting, slicing and dicing of collected data. HIS provides excellent clinical information to ensure patient care is handled with utmost priority; it generates extensive management reports, operational statistics and offers a query module. These are powerful, feature laden and extensively tested software that take care of the simplest and most intricate functions in the hospital.

Modules for patient administration may be registration; emergency and triage; OPD appointments scheduler; admission; discharge and transfer (ADT); inpatient bed and ward management. Clinical modules may include a workbench (sub-module where the can perform all his system related functions) for doctor; nursing workbench; operating theatre and anesthesia; electronic medical record; computerized physician order entry (CPOE); clinical decision support system (CDSS); e-prescription; e-medication administration record (e-MAR); clinical support modules may be for laboratory; pharmacy; radiology with PACS; blood bank; dietary departments. Material management suite can have modules like inventory; procurement; supply; central sterile supply department (CSSD); kitchen; linen; laundry; housekeeping; maintenance and fixed asset. Modules for revenue management may include finance; OP and IP billing; insurance; claims and contracts; MIS reporting; HIS may have a large variety of tools like the messenger, forms and reports designer etc.

To achieve a complete automation, the HIS must be tightly integrated with disparate products like Radiology Information Systems (RIS) and Picture Archival and Communication System (PACS), Lab Information Systems (LIS), Patient/Customer Relationship Management (CRM), Knowledge Management (KM) and Business Intelligence (BI) Applications. Back office modules like the Finance, Fixed-Assets, Inventory and Procurement should either be part of the HIS, besides billing and pharmacy modules, or it should have the capability to integrate with third-party software's. This provides an opportunity to work towards a 'flawless', completely paperless and filmless organization, where patient-specific data (clinical and financial) can be retrieved and disseminated across the entire hospital seamlessly and in more technically advanced cases, also integrate with other networked or outside network hospitals.

## 2.4 Standards in Healthcare IT and Interoperability

The data flow between different modules of the HIS and other disparate systems like third party software needs integration with existing and new architectures, application systems, and services. These systems further need to go beyond their geographical boundaries and share clinical information with clinical systems of other hospitals in the same city, country, or with systems in other countries. Classical example of this clinical data sharing is in cases of medical tourism where patients travel to different countries for cheaper and international quality of healthcare services.

The changes redefining healthcare worldwide are also creating a demand for a new healthcare information infrastructure. Core elements of this infrastructure include patient-centered care, facilitated by electronic patient record (EPR) or electronic medical record (EMR). The EPRs available beyond the providing healthcare facility ensures continuity of care enabled by the sharing of patient information across information networks, and outcomes measurement aided by the greater availability and specificity of healthcare information. To make these diverse components work together, healthcare information standards, classifications, guides, practices, and terminology are required.

Standards are the key words facilitating the sharing and exchange of information between departments, health agencies, and health workers. They are needed for the information content, language used, database, and system architectures to facilitate linkage between systems through an apparently seamless integration of highly distributed systems. This is often referred to as 'Interoperability'. Many standards applicable to information and communication technology generally need to be adopted within the health sector.

Some of the commonly used standards involved in healthcare information infrastructure are Digital Imaging and Communications (DICOM), Health Level Seven (HL7), Institute of Electrical and Electronic Engineers, Inc. (IEEE), (Medical Data Interchange Standard (MEDIX), Clinical Data Representations (CODES), International Classification of Diseases (ICD) codes, The Systematized Nomenclature of Human Medicine (SNOMED) International, Laboratory Observation Identifier Names and Codes (LOINC). These are some of the main standards and namespaces used in healthcare informatics and are followed in hospital information systems with international standards implemented in hospitals that provide world class patient care. It is vital for information sharing that clinical information is captured in systems using internationally understood codes and language.

This is where these healthcare standards play a pivotal role: for exchange of health information of a patient between different modules of a HIS, between disparate systems e.g. an HIS and LIS or RIS/PACS of different providers or between two HIS of different hospitals in same or different geographical locations.

## 2.5 Challenges in HIS Adoption

Even though healthcare institutions have the intent to go for computerization, there are inhibitions, issues and challenges for its adoptions. Investor's in these institutions, both from government or private side do not see as much worth in the investment rather than spending on improving healthcare facilities, strength of medical and para-medical staff, bed strength and vista of clinical departments. Even if automation is attempted, HIS implementation projects either delay invariably or never get completed or compromise on the vision of implementation initially envisaged. HIS implementation and adaptation in hospitals is a complicated task as compared to

other information systems in different business areas. System infrastructure design, requirement specification, master data collection and definition, integration with other systems, localization and training, and final system test are the main activities of the implementation. During implementation phase, hospitals can face many difficulties in the mentioned areas. Compared to other industries, the healthcare industry has been relatively slow in adopting information technology. Currently, computerization of medical care is in the process of evolution, being hampered to some extent by technology, since no perfect interface exists between medical care providers and computers. Medical care personnel are usually on the move, while computers tend to tie them down. PDAs, Smart Phones, Tablets have been tried but they have not achieved widespread adoption as yet. This is a big hurdle towards implementation of a HIS, since it requires care providers to start working differently than what they are used to.

HIS implementations fail more often than hospital administrators would like to acknowledge. There are three common scenarios of HIS implementation failure. An implementation may start well but may never be completed. The common reason for this is inflexibility of the HIS, inexperienced implementation teams, or a weak administrative will. Another scenario is where the HIS implementation has been completed but only part of the HIS functionality has been implemented. It is also not uncommon to find that a year or so after a 'successful' HIS implementation, the hospital staff have stopped using the software. This might be either because the software was not user friendly or the workflows were not well planned and configured.

According to a number of studies about HIS implementation (Ash et al., 2003; Ball, 2003; Berg, 2001; Benson, 2002; Little Johns et al., 2003, Joel Rodrigues, 2009; Dudeck et al, 1997), implementation difficulties were found to be relating to:

1. infrastructure, application, and organization of the implementation processes;
2. management of end user contribution;
3. integration of different information systems, external systems, and independent physician groups;
4. struggling with balance among different departments, end users and stakeholders;
5. redundant, inaccurate, uninformative, or confusing master data;
6. standardization of data definitions, representation, and vocabulary;
7. technical requirements planning;
8. end user profile and resistance;
9. end user training;
10. software immaturity;
11. support after implementation;
12. lack of information about HIS implementation;
13. ignorance of administrative needs of hospital.

## 2.6 HIS aides in efficient Hospital Administration

Hospitals that have adopted and implemented HIS successfully usually experience several benefits from hospital admin-

istration and management perspective.

Some benefits such as reduced transcription and medication errors; reduced pilferage; enhanced information integrity; reduced duplicate entries in multiple registers; optimized lab/radiology report turnout time; seamless information exchange between departments rather than relying on paper, telephone and manual interaction, are invaluable.

After HIS implementation, patient interaction points like registration, appointment, admission desk; insurance and billing are computerized and generate electronic printouts. This not only looks impressive as all patients receive legible and computer generated bills and prints, but also means that all patients are centrally registered in system and all money related transactions of patient are recorded in system and can be audited and controlled. Administration not only has record of its patients and their care history in the hospital but can also prevent patients from fraudulent billing and hospital from revenue leak due to unapproved discounts and by other inappropriate means.

Hospital will surely record reduced waiting time of patients in registration, OPD, report collection and billing queues which will enhance patient satisfaction levels, portray better quality of hospital services and has also in turn increase patient footfall in the hospital. Queue management is otherwise very chaotic for the hospital administration.

Hospital administration faces very frenzied situations due to allocation of patients to beds. The front office allocates bed to patient which was actually occupied by another patient. This is due to improper communication between front office and the nursing stations which has changing shift of nurses and multiple nurses attending the patients and phone. Confusions on bed availability will be diminished as bed availability in a ward will now be seen on computer by admission user and he can allocate free bed to patient directly without any scope for communication gap between ward nurse and him.

HIS offers automated appointment system for OPD consultations, surgery, laboratory and radiology investigations. Due to this, most patient visits to the hospital and its departments are planned in nature. This is beneficial for the hospital as patient management is easier and also for the patient, as this will reduce their waiting time;

Due to automation of inventory, procurement process, stock management in all departments, specially pharmacy, operation theatre store, wards, laboratory, radiology, main store etc., is auditable. This will prevent noticeable revenue leak and pilferage.

Implementation of finance module with tight interface with billing and insurance modules will help to plug in revenue leaks noticeably. Money will be collected and consolidated in the same HIS and multiple reports will be available to the hospital administration all the time. They do not have to wait to view reports consolidated from manual and disparate systems, which is often misleading and with insufficient infor-

mation.

All patients treated in the hospital having aHIS compliant with EHR standards of India, will be registered with their demographic details including AADHAR or other approved identifications scanned and uploaded in the system. This will help the management in ensuring that identity of all patients visiting the hospital is known and demographics are available for studying disease trends and for statistical analysis and reporting to the government and other agencies as per law. This is difficult to achieve easily in a manual system.

Information System in a hospital will attract inflow of not only self-paying or cash patients but even patients covered by Insurance companies, Corporate and TPA as tie-up of hospital with these usually requires HIS as a prerequisite. This will hence help in increasing revenue inflow for the hospital.

Nurses will begin by recording vital signs, creating duty roster, doing stock transactions, bed transfers and scheduling in the HIS but later may perform clinical documentation in system also. All clinical orders, medication administration, allergy and disease (ICD) recording, nursing notes, care plan, input-output chart, birth and death notification, OT scheduling and other nursing documentation, can then be entered directly in the HIS. This will be a remarkable achievement for the hospital's management as streamlined processes will obviously make the patient's stay in the hospital more comfortable. Quality of care delivery will be enhanced and clinical data will be available in the system which will be a very positive move towards EMR and EHR creation.

With the use of HIS by the doctors, several clinical documents which are a part of the EMR and EHR will now be recorded in the HIS like OT, PAC and anesthesia notes; patient chart and clinical case sheet; order entry; clinical notes; immunization, diagnosis and allergy recording; discharge and follow up advice; discharge summary; patient referral; nursing, surgery and diet orders etc. Doctors will be able to view laboratory and radiology reports and PACS images from the EMR itself and receive interaction and safety alerts. Availability of all clinical information of the patient, entered by various doctors and nurses during present and previous visits will surely be much appreciated by the medical fraternity of the hospital which will be an achievement for the management. Hospital's management should record, in due course of time, lower medication and prescription errors. There will be fewer chances of clinical data getting lost due to loss, spoilage and destruction of medical record files.

Episode wise clinical history of patient would be seen in the EMR for all visits of the patient in the hospital, be it as outpatient, inpatient, and daycare patient or in emergency. Past reports and disease information will also available for the present consultant to make a more informed and appropriate care plan. Patients usually forget past case papers during their doctor visits due to which sometimes, negligence is caused and the hospital administration even has to face medico legal issues.

Discharge process will get streamlined as all patient's discharged from hospital will be discharged from HIS in stages from marked for discharge to clearance from all departments to physical discharge. Average time taken for discharge may even be reduced to 2-3 hours from what the hospital's without computerization face (from 4-8 hours or more). This will mean that bed turnover rate will increase manifold. More patients can be admitted per bed leading to enhanced revenue for hospital and lessened anxiety of patients and their attendants due to usually prolonged discharge duration.

As a part of automation, every department may have well-defined standard operating processes (SOP) after computerization with established performance measurement metrics. While defining the SOP for departments, care can be taken that processes defined are in line with the quality policies of the organization in conformance with the statutory requirements of ISO 9001:2000, JCI, NABH and NABL certification and standards.

The hospital administration will be able to generate MIS and statistical reports for various departments through the HIS and take decisions for betterment of hospital administration based on trends, forecasts and projections in the reports. Medical records department will be able to send scheduled reports to government and statutory agencies in time, with correct information generated from the HIS.

The hospital administration and key stakeholders will definitely acknowledge an incremental growth in quality, revenue, better hospital administration, world class patient care, and state of the art service. The hospital will come to par with other computerized hospitals in the quality of care it provides to its patients and their overall patient experience.

HIS helps the hospital specially the clinicians in decision making. It provides clinicians with access to a consolidated patient record from within the hospital as well as from their clinics (on a secure internet network) with up-to-date information across departments, so that they can make more informed decisions. The patient also gets continued care after discharge from hospital at the doctor's clinic setup or the hospital's outpatient department. The HIS can provide an entire range of clinical, administrative, financial, laboratory and radiology information in a single data repository, enabling the clinicians to make faster and better decisions for its patients, which improve quality of care. Not only this, if the HIS is on Microsoft platform, the doctors can even access the patient EMR (only clinical information, reports of all visits etc. as per configuration) from any internet enabled smart devices like smart phone, personal computer, tablet etc. Few examples of these decisions could be like getting real-time information about bed availability at the hospital which can enable the doctor to plan a patient's admission to the hospital; information about current medications taken by the patient; known allergies and risk conditions recorded; potential for drug, food interactions and other safety alerts; details of their ongoing care process; insurance coverage of the patient to suggest suitable health package; past transfusion reaction history; serology positive status

etc. can empower a doctor to make appropriate and timely clinical decisions for the patient and even for the safety of hospital staff by making them aware of the patient's infectious status through the HIS.

Computerization helps in fulfilling the stated and implied needs of a patient. A patient visiting a hospital, today, needs patient care of international quality at affordable cost and an assurance of safe medical care delivered to him with transparency and privacy. Above all, a patient has a right to information about his health and care plan.

HIS helps in improving the overall patient experience with reduced waiting and queuing time at the registration, appointment, billing and admission desks; shorter length of stay as in-patients; negligible chances of medication and clinical errors; transparency in information regarding their health condition, care plan and cost of care; lesser time in discharge process and provision of cashless billing facility due to the hospitals tie up with creditors.

Patient safety in hospital emphasizes on reporting, analysis, and prevention of medical error that often leads to avoidable and adverse healthcare events. Because the HIS saves time and controls costs by eliminating duplicate tests and other redundancies, staff can now focus more attention on patients.

The new hospital information systems have enhanced the control and accountability that the clinical staff has concerning decisions they make about patients. Any changes and irregularities in planned patient care, re-admissions within 24-48 hours, specious death in hospital, re-exploratory surgeries, medical negligence, prescription or medication errors, hospital acquired infections, needle prick injuries, patient fall cases, blood transfusion reactions, post-operative reactions, in-patient emergencies, code blue etc. are promptly reported by the HIS to the hospital administration as well as concerned doctor and his team. Cause and response to these events can be assessed by the management easily based on information available in the HIS readily. This will lead to a greater sense of responsibility amongst the care providers.

By adopting the CPOE and CDSS modules, the doctors are provided various interaction and safety alerts from time to time. The patient/attendant gets a copy of his prescription with clarity on route, form, dosage and price of the medicines in legible computer generated, printed copy. He can validate the drug being administered with the one prescribed. Automated alerts sent to doctors about his patient's significant health events such as admission to emergency department or inpatient ward, abnormal or critical high/low lab test values, further fulfill patient safety needs. A patient is assured that his doctor is aware of his health condition.

HIS helps the hospital team to provide the patient, information on cost of treatment and care, packages and payment options available, transparency on bills and expenses, information about his disease etc. as this information is pre-fed into the system and is readily available for dissemination and use. More benefits will be reaped by the patients and hospital as

time passes after computerization, as personal data of patient will only need to be entered into the system once, reducing the rate of errors and eliminating time wasted in re-entering the same data. There will be an improvement in the quality of care experience as the patients will not need to carry previous medical reports or tests, thus ensuring their privacy both inside and outside the hospital.

Human error in the complex world of modern medicine is inevitable. Harm to patients as the result of these errors is not. A modern HIS may have surgical safety checklist, safe child birth checklist and trauma care checklist as per WHO guidelines. The purpose of a checklist is to detect a potential error before it leads to harm. With the help of these checklists, the nurses will be able to ensure and record in the HIS, that utmost care as prescribed by the international patient safety norms has been taken care by them. Checklists allow complex pathways of care to function with high reliability by giving users, especially nurses, an opportunity to pause and take stock of their actions before proceeding to the next step. The WHO Surgical Safety checklist will improve reliability and help to standardize care for thousands of individuals globally.

## 2.7 Road Map

Adoption of hospital information systems by all health care institutions of India, interoperability between HIS and EMR systems of these health care setups in rural and urban India and them integrating with the EHR and National UID or AADHAR initiative of the Government of India, is eventually the roadmap which hospitals of India .

With present day perspective of Indian healthcare system, patients visit several health providers, throughout their life span, right from visiting a sub-center, community-center or primary-health centre in rural setups, or a general practitioner in his local vicinity, to a government /private hospital or clinic at the district, city, state or central level. Health records get generated with every clinical encounter during these outpatient, inpatient or emergency visits. However, most health records are either lost, or remain in the custody of health care providers and eventually get destroyed, as per the retention period of medical records generally followed by hospitals in India i.e. for 5 years for out-patient, and 10 years for in patient records. Medico legal records are however retained permanently. This is applicable to health care setups with a proper medical record department only. There may be negligible to no health records maintained by private practitioners, at clinic setups and by rural healthcare setups. A typical Indian patient with varying literacy and awareness level usually does not retain his clinical documents either. Medical record is the property of the hospital and 'not' of the patient, clinical department or care provider/s and the patient also has no proprietary right on his own clinical record today. What the patient carries with him is the discharge summary of his clinical encounter along with his investigation reports and usually radiology films/images. Also, important clinical data is not available for research and for reference to aide in clinical decision support. Study of disease trends and statistical analysis of

clinical nature also suffers. Due to these and many more reasons, having an EHR of a patient with health records of each clinical encounter at varying healthcare setups, be it government or privately owned, is 'actually' a dream come true for India but a roadmap for Integrated Healthcare Delivery System of India.

With uniformity in this view, EHR standards were released in August 2013 by the Ministry of Health & Family Welfare, Government of India. The EHR standards were formed after a thorough study and analysis of National EMR/EHR and Healthcare IT (HCIT) programs implemented in the world. These standards emphasize the use of National UID or AADHAR number as the primary or secondary Unique Health Identifier (UHID) of a patient visiting a healthcare facility. The AADHAR number will serve as the unique patient identifier for all healthcare organizations across the nation. The other ID, may be used to identify the patient within the CDO and as a reference in its EMR system. The EHR standards also define the Healthcare IT (HCIT) Standards applicable for India, besides the inclusion of National UID or AADHAR number. So, going forward, the AADHAR number will act as the unique identifier for the EHR of an Indian citizen, which will be a longitudinal health record of a citizen's lifespan with several clinical encounters in different care settings.

The basic idea of the EHR standards is to have a country wide rollout of EHR for all healthcare organizations and link it to the National UID of the patient (AADHAR). Connecting rural and urban healthcare delivery systems through UID and EHR standards seems like a magnanimous task for now, but if given aggressive timelines and adequate impetus of implementation, will surely see the foreseen success. With more and more hospitals adopting HIS in India, this dream will eventually come true. Once clinical data begins to get captured in the HIS, the paper-based medical records will be replicated if not replaced by the electronic medical records. EMR's created by the various care providers that a person visits during his/her lifetime will be stored in a central clinical data repository or at least be shareable through the use of interoperable standards prescribed by the EHR standards. This will, sooner or later create electronic health record or EHR of the person bringing his complete health information together, for supporting better clinical decisions, and more coordinated care amongst various care providers. With a boom in global medical tourism trends, in the coming years, EHR of an Indian patient may even be accessible by care providers of other countries and vice versa.

### 3. CONCLUSION

Integrated Hospital Information System (HIS) is vital to good decision making and plays a crucial role in the success of a hospital. In computerized hospitals, HIS has enabled improved patient care, patient safety, efficiency, plugged in revenue leaks and pilferages and has reduced costs. It has provided easy access to critical information, thereby enabling hospital administration to make better decisions on time. It

has helped in meeting the short-term objectives of computerization, to reduce costs and improve the accuracy and timeliness of patient care, accounting and administration, record keeping, and management reporting and also the long-term goals to build and maintain patient database for analysis of data to facilitate decision-making process.

Hospitals in India, hence, must ensure computerization of all its departments in due course of time and contribute towards developing an Integrated Healthcare Delivery System for India.

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