

# Common EHCR Architecture

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Health Care Industry is growing very fast in India. The sector is expected to post the highest year-on-year growth in earnings in the fiscal year to March 31, 2007, says Reuters. It is set to post a 42 per cent rise in earnings in the year to March 2007. These figures are driven by availability of quality healthcare and the huge rise in numbers visiting India for treatment.

There is also a need to strengthen the Public Health Services to take it right to the socially and economically challenged population of the country. The Primary Health Care (PHC) centers have to be empowered with Information Technology to reduce the load on secondary and referral health care centers. There is very heavy load of patients on secondary and specialty health care centers due to non-efficient system of Primary Health Care (PHC). Keeping medical record electronically at one place and accessing it electronically by health care centers may change the present way of health services. The role of Electronic Health Care Record (EHCR) is of significance importance in terms of overall effectiveness of health care services.

A medical record<sup>2</sup> can be defined as – *“an orderly written document encompassing the patient’s identification data, health history, physical examination findings, laboratory reports, diagnosis, treatment and surgical procedures, and hospital course. When complete, the record should contain sufficient data to justify the investigations, diagnosis, treatment, and length of hospital stay, results of care and future course of action.”*

## Encouraging growth targets

The healthcare industry employs over four million people, making it one of the largest service sectors in the economy. A joint study by the Confederation of Indian Industry and McKinsey shows:

- At the current pace of growth, medical tourism, currently pegged at US\$ 350 million, has the potential to grow into a US\$ 2 billion industry by 2012.
- Healthcare spending in the country will double over the next 10 years. Private healthcare will form a large chunk of this spending, rising from Rs 690 billion (US\$ 14.8 billion) to Rs 1,560 billion (US\$ 33.6 billion) in 2012. This figure could rise by an additional Rs 390 billion (US\$ 8.4 billion) if health insurance cover is available to the rich and the middle class.
- The voluntary health insurance market, which is estimated at Rs 4 billion (US\$ 86.3 million) currently, is growing fast. Industry estimates put the figure at Rs 130 billion (US\$ 2.8 billion) by 2005.
- With the expected increase in the pharmaceutical market, the total healthcare market could rise from Rs 1,030 billion (US\$ 22.2 billion) currently (5.2 per cent of GDP) to Rs 2,320 billion (US\$ 50 billion)-Rs 3,200 billion (US\$ 69 billion) (6.2-8.5 per cent of GDP) by 2012

Source: <http://www.ibef.org/industry/healthcare.aspx>

Keeping medical record of patient in electronic form is required to facilitate a quality health care to all so that the same could be accessed from any secondary health

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<sup>2</sup> GD Mogli: Medical Records – Organization and Management, JAYPEE

care hospital especially in super specialty hospitals. Due to negligence / illiteracy / non-conducive environment, the physical records of a patient are of no use after some time. If entire medical history of the patient, even if consultation has been given in different hospital is available at one place, there will be less time required to provide medical assistance to the patient. There are number of situations where patient is not able to collect the record and all tests, history, etc has to be done again and again over a period of time. The EHCR will be saving hard earned money of patients if the lab tests are readily available for examination.

A Complete Electronic HealthCare Records (EHCR) contains following five levels<sup>3</sup> –

1. The Automated Medical Record is a paper-based record with some computer generated documents
2. The Computerized Medical Record (CMR) makes the document of level 1 electronically available.
3. The Electronic Medical Record (EMR) restructures and optimizes the documents of the previous levels ensuring inter-operability of all documentation system.
4. The Electronic Patient Record (EPR) is a patient-centered record with information from multiple institutions.
5. The Electronic Health record (EHR) adds general health-related information to the EPR that is not necessarily related to the diseases.

The Electronic Medical Record shall broadly facilitate following –

- Access of patient data by clinical staff at any given location
- Building automated checks for drug and allergy interactions
- Availability of clinical notes and prescriptions
- Lab reports along with timeline analysis
- Accurate and complete claims processing by insurance companies (This has potential for a business model to subsidize the implementation and operational cost involved in EHCR.)
- Analysis of various diseases and development of a warning system devised from trends of occurring the diseases.
- Planning and Development of Health Facilities depending on actual requirements
- Research and Development
- Government will have database of citizens that could be used for other planning purpose.
- Insurance companies may use this data for the purpose of authenticating fitness of customer.
- Pharmaceutical companies may plan manufacturing of medicines as per the trends readily available to them.

### **The Challenges:**

There are manifold challenges in developing a low cost (Cost to user), EHCR on common architecture. Following are some of the major challenges in implementing the EHCR –

1. Interoperability with various Hospital Information and Management System (HIMS) in market.

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<sup>3</sup> Medical Record Institute website <http://www.medrecinst.com/>

2. Adding legacy data (Physical record like x-rays, MRI reports, prescriptions, etc)
3. Adhering to various international standards of managing information like International Coding of Diseases (ICD – 10), Health Level (HL-7), etc
4. Privacy of health records, legal issues.
5. Preservation of electronic records
6. Security of patient record and right to access.
7. Present framework of health service. There will be lots of Business Process Reengineering required.
8. Duplicity in Health Record. (Multiple health record of same patient as one may go to another place and again get a new health card prepared)

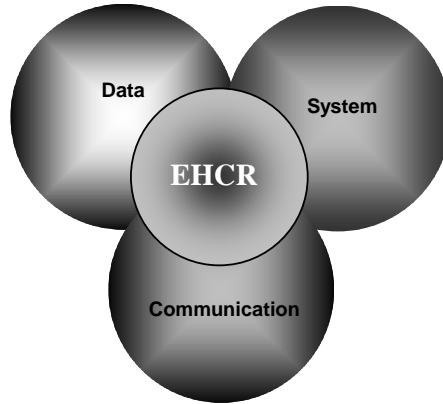
The biggest challenge is to create a common EHCR System suiting to Indian conditions and acceptable to all kind of medical service providers. There are already International Standards available for EHCR but hardly followed even in developed countries. Inter operability in various EHCRs available in different Hospital Information Systems is a big concern in having common EHCR.

#### **The Opportunities:**

India is a fast growing country in the field of Information Technology. The National Informatics Center (NIC) has already setup its network up to the block level in India. The economy of India is blooming with lots of business opportunities for medical as well as technical professionals. As mentioned earlier, Health Care Industry is also growing equally. There are enough opportunities for insurance, pharmaceutical and medical equipment manufacturing companies to come forward with a business model to create a common EHCR system which could be afforded by a health care center having minimal infrastructure. This EHCR system should become the integrated part of all HIMS and other application. In IT term, it should be like Transmission Control Protocol/Internet Protocol (TCP/IP) suite without which no Operating System can exist in the market.

There are three components involved in EHCR system –

1. Data Storage: – We already have data centers available with NIC at state and district level with good security and access system
2. Communication System: Fortunately, there is a very good communication network available all over India up to block level mainly through Bharat Sanchar Nigam Limited (BSNL) / Mahanagar Telephone Nigam Limited (MTNL) and many private players. Other private players are following this trend.
3. The application System: Entire EHCR system has to evolve around the common architecture to be developed and to be implemented in all HIMS regardless of operating system, environmental issues, health care standards, etc.



This is right time to take the benefit of this evolution and connect health services of major hospitals / clinics / nursing centers to the block level all over country. The telemedicine is easiest thing to start but this does not serve the purpose in absence of complete medical record of the patient.

**The Approach:**

**A. Development of EHCR**

A top to bottom approach will be required to develop a common Electronic Health Care Record system in India. The group of experts from Medical Administration, Clinicians and Information Technology will have to contribute on a common platform to develop a low cost interoperable EHCR system. This EHCR should be integrated with all HIMS as required component. Involvement of various medical equipment companies will also be required to ensure the compliance of international standards of data exchange.

A wide variety of data standards, medical terminologies and coding classification systems will play a major role in making electronic medical records systems interoperable. Same time, there is need to evolve EHCR in local conditions and even in local language.

Once the common standards are developed and frozen by the set of experts and supported by the Government, there is high possibility of various business models including Public Private Partnership (PPP). The IT Companies involved in health care solutions will have to adopt common architecture in the HIMS.

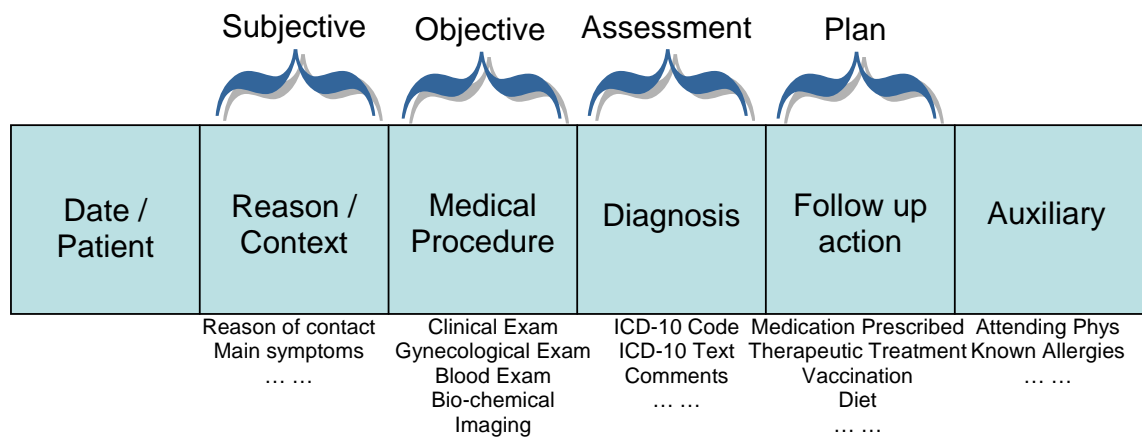
The EMR will have following basic data structure to identify patient as –

1. First time entry of a patient at PHC / Hospital, etc. At this time, a plastic card will be issued to him / her containing the EMR Id, Name, Sex, Age, Blood Group, Allergies, etc. Following is an indicative data structure

EMRID	Number (Unique ID) <i>This can be a combination of unique city code like pin code / short form town / STD Code / or code provided by the election commission to that particular assembly / constituency followed by the year and serial number. A small group may work on this issue.)</i>
Name	Text
DoB	Date <i>(This will only be for medical purpose, by no means that should be taken a proof of age)</i>

Sex	Selection
Blood Group	Selection
Diabetic	True / False
Town / Village	This will be semi-hard coded. At the time of installation of software, demographic details shall be given one time at the time of installation to reduce data entry time.
Address	Text
Identity Proof	Any one as prescribed by Election Commission so that it is ensured that the health care card is not misused.

2. Updating of EHCR: Generally, clinical data is formed by 6W's defined as Who / What / When / Where / Why / Whom. This can be defined by image given here -



This activity will require lots of initiatives from both Government as well as private to update the EMRs. If EMRs are not updated then its usefulness will be limited. In its first phase, we should be limited of updating everything except images as it may create problems in accessing the data for both retrieving as well as entering. In its first phase, data updating should be limited to non-images records. Once the feasibility of storing images possible then we may think of storing images too.

What can be stored in first place: Reports of LFT, Blood test, and Blood Pressure, urine tests. Radiological images are possible practically but not all nursing homes; small hospitals can bear the availability of new machines, etc. However, the EMR can have the date of x-ray or imaging and its finding / observation in textual form.

#### B. Storage of Data

Under data protection legislation and the law, generally responsibility of patient records (irrespective of the form they are kept in) is always on the creator and the custodian of the record, usually a health care practice or facility. In all hospitals, there is a separate Medical Record Department (MRD) for this purpose. To store the EHCR, there is need to

change the way, we manage the records today. The basic responsibility may remain with the creator of record but the physical storage place may be shifted to NAS (Network Accessed Storage)/ SAN (Storage Area Network) in place of MRD. The NIC may be entrusted with this responsibility of co-locating the Storage Area Network<sup>4</sup> (SAN) / Network Attached Storage<sup>5</sup> (NAS) at state / district level in India. The computerized system installed at various health care providers may access the required patient information directly from NIC provided they have enough rights. For example, <http://jhansi.nic.in> contains most of the information of Jhansi. Now, let us use these websites to use the database also to provide dynamic information.

### C. Business Process Re-engineering and Implementation

There should be a mandate from Government to use common EHC based Information System only and it should be one of the pre-requisite for registering Nursing Homes, Laboratories, Hospitals, etc. In the qualifying parameters to setup a health care facility, daily updating (if not online) of data should be made compulsory. Daily updating should include births and deaths, medical testing reports, admission, discharge, etc. The escalation procedures should be inbuilt in the system to ensure the compliance. The exception reports should be automatically emailed to concerned CMOs of Districts on daily, weekly basis to ensure updating of data.

Like PAN card, a health care card containing unique MRID (Medical Record Id) on it, should be issued to all. (We are not going for the integration of all kind of services on one card, as an when that come up, this may also be included). Thanks to the reduction in cost of material, cost of card will not be more than INR 2-5. To encourage the use of card, the card holders may be given additional benefits like priority in medical checkup, cost benefit in pathological testing, etc.

The EMR implementation follow the 80:20 rule; that is, 80% of the work of implementation must be spent on issue of change management, while only 20% is spent on technical issues related to technology itself.

To test its feasibility, a pilot can be run involving State Capital, one district and three four blocks of that district. The Government is to give necessary instructions and infrastructure for compulsory Health care card on the pattern of Voter Id Cards.

This system has potential of becoming a people's application which will get implemented on the public demand once its usefulness is understood by the public as it happened in Railway / airline reservation. Having this facility in nursing homes will become a quality standard in the nursing homes / testing centers.

### **Initiatives from Government:**

National Health Policy-2002 (NHP) envisages an IEC policy, which maximizes the dissemination of information to those population groups, which cannot be effectively

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<sup>4</sup> A storage area network (SAN) is a network designed to attach computer storage devices such as disk array controllers and tape libraries to servers.

<sup>5</sup> A disk array storage system that is attached directly to a network rather than to the network server (ie, host attached); functions as a server in a client/server relationship, has a processor, an operating system or micro-kernel, and processes file I/O protocols such as SMB and NFS

approached by using only the mass media. National Health Policy has not emphasized on taking technological advantage in Health Sector especially in Public Health Care.

Indian Share market, commodity market are torch bearers of innovations where entire scripts are kept electronically in DEMAT form by the users in the stock exchange and trading worth of millions of rupees is done online daily. A similar system has to be developed for health records that may be unique in the health sector.

There are two immediate requirements for Health Care Industry –

1. Development of low cost application for managing health services, based on an acceptable common architecture for primary health care centers. This software should take the advantage of broadband boom in India to connect to the major hospitals as and when required. The software should not be proprietary in development and in its use. The primary EMR of a patient must be generated by this application only. This EMR should be shared by any referral hospital.
2. Develop Data Centers at State and National Level for Health care Services under National eGovernance Project (NeGP) to provide sharing of EMR across the country. The access to these Data Centers should not be limited only to Government Hospitals and Dispensaries but also open to private hospitals and clinics. There is a possibility of having a Business Model for sharing the information.

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