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### eHealth For India - Path Trodden and The Vista Beyond

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**Key Points:**

- Healthcare renaissance in India
- Quality healthcare for all
- iHIND & EMR interoperability standards – Government leadership
- Challenges ahead

## Introduction

Healthcare globally has reached a tipping point beyond which it is not sustainable in its current form, in both the socialist and market driven models. Health economics, preventive medicine and wellness are now the new mantra to evolve from sick-care to healthcare. Healthcare systems yearn to restructure, whereby primary/GP-general practitioner/FP-family physician are empowered to manage the major chunk of work. They are the gateway through which all referrals are made for specialty work. Patients' hospital stays need to be minimised to bring down overall costs (direct and indirect) with rational antibiotic usage and minimising of practice variability. Technology has been playing a major role in healthcare during the last century; with the advent of ICT in the last few decades de novo avenues have opened up which are still being explored. Healthcare IT (HCIT), though a relatively young entrant to healthcare, has enabled transparency, integrity and patient safety. The dismal success rate of IT implementations is seen in healthcare too, but recent publications are unravelling the mystery around HCIT failures and offer hope. Being cognisant of the pitfalls and working towards a goal with clearly defined milestones and all major stakeholders committed can ensure successful HCIT deployment.

**Healthcare Renaissance in India**

**Indian Healthcare System:**

India inherited the British NHS (national health services) model of healthcare. It is a socialist model with healthcare provided as a service free at the point of care, funded by taxpayers. Health was on the concurrent list (central and state government responsibility) but today is within the mandate of the state government. The government of India plays a regulatory role with overall control of medical education/research, public health/epidemiology/infectious disease control and all clinical specialties. They also fund national disease control programmes via the National Health Mission (NHM). A separate wing of the ministry entitled AYUSH (Ayurveda, Unani, Sidha, Homeopathy, and Reiki) monitors complementary medicine.

Indian healthcare underwent a radical transformation in the 1980s with corporate hospitals emerging in urban India. These hospitals deliver world-class health services for a fee and are almost exclusively concentrated in the cities. The advanced capability that these hospitals have acquired is evident from the fact that they are accredited by international standards bodies such as the Joint Commission International (JCI), the International Standards Organisation (ISO), and the National Accreditation Board for Hospitals and Healthcare Providers (NABH). Relatively lower cost of health care in comparison to developed countries, coupled with international quality, has positioned India as a major destination for health care services.

**The Change From Hospital To Home Based Care:**

There is a tendency in the western world to move from hospital-based to home-based care today. Better and more effective antibiotics mean patients do not have to stay in hospital for treatment of most illnesses. Nosocomial MRSA (methicillin resistant staphylococcus aureus) added to making home-based treatment preferable to being an inpatient (MRSA and other hospital acquired infections are almost impossible to treat with known antibiotics and result in great morbidity and mortality). The elderly population, whose numbers are increasing as a ratio of the population, benefit most from such home-based treatment. It is making more economic sense to be able to provide the services of specialists, to as many as

possible, in fields such as dermatology, radiology and pathology. Gustke and colleagues concluded positively after evaluating patient satisfaction in using telemedicine for home based care (Gustke et al. 2000). Personal health records (PHP) are emerging where patients own, maintain and decide who their medical records are shared with. Online consultation and telemedicine for accessing specialist services are already being offered in India today.

Clinicians are adapting to the increasing presence of technology and HCIT in their everyday practice. Radiologists, dermatologists, psychiatrists, cardiologists and pathologists are some of the specialists who are early adopters.

**Globalization, eHealth And The Need to Transform**

As was the case with telecommunications a decade ago, India has been able to leapfrog to adopt the latest technologies without undergoing the long, painful, risk prone and costly adoption rigmarole of early adopters. Healthcare IT is following a similar path, resulting in the best technology being identified and deployed to optimise healthcare system performance.

Virtualisation, cloud based software and SaaS (Software as a Service) technology are mature technologies, which developing countries such as India are adopting rapidly. The low capital expenditure is an added bonus with the cost getting built into operating costs, on a pay-per-use model. India, being the software capital of the world with captive engineering centres for most top multinational companies, has the engineering skills and expertise to tackle the many healthcare system challenges head on. Taking a cue from Prof CK Prahlad's bottom of pyramid (BOP) theory (Prahlad 2014) many MNC (multinational companies)have started researching the needs of our healthcare workers that are distinct from those in western countries. Once the problems are identified, it is only a matter of time and business fitment to put together a team and find not one, but multiple solutions.

**Quality Healthcare For All – EMR Role**

Electronic medical record/electronic health record (EMR/EHR), though used interchangeably, are distinct concepts. They are healthcare record data in an electronic form; ensuring data integrity at point of capture, ability to store infinitely in various forms and provide fodder for powerful analytics to be run, thereby data is reorganised into information from which knowledge emerges. Literature and experience reveal gaps in the care process resulting in preventable morbidity/mortality exceeding 1,00,000 per annum in the most advanced healthcare system in the world, USA (IOM 1999). Reliable data availability at the right point, and using it to continuously improve the processes, can reduce this figure. The accuracy, integrity, reproducibility at multiple points, analytic capabilities and transparency that EMR brings into the care process nails down quality (PCAST2011).

EMRs have kept pace with Moore's law (chip performance doubles every 18 months) over the years. As computer science/information technology (CS/IT) has moved away from client-server to a cloud and social, mobile, analytics & cloud platform (SMAC), so has the EMR. EMRs have been continuously evolving from being a collector, documenter (automation), helper (CDSS-clinical decisions support system), colleague (workflow support) to mentor (guided care). The ubiquitous nature of IT spanning mobile, tablet, laptop to workstation is used effectively by EMRs to be always available at point of care (POC) for patient safety. In 2014 EMR hosted on a cloud (SaaS-software as a service & IaaS-Infrastructure as a service) paid for by usage (pay-as-you-go model) built on SCT-Snomed CT, HL7 and DICOM standards with UI/UX-user interface/user experience ensured, is being demanded by clinicians.

TeleICU is a good example of how technology when deployed correctly can solve healthcare problems. Intensive care units in multiple tier 2/3 towns are connected to a central command centre manned by clinicians round the clock. Many benefits accrue; reduced length of stay, antibiotic use rationalisation, ongoing skills enhancement, ability to handle complications and the reduced need for shifting patients to tertiary care.

**Choosing The Right EMR For a Healthcare Provider**

EMRs should be chosen carefully by medical informatics professionals who understand the clinical domain, after mapping the existing workflows and processes. A clear road map needs to be defined with milestones and destination agreed by all stakeholders. Medical informatics research is showing that to start with, a vendor sells a concept to the customer, with the customer being unaware of the full capabilities of the product. As customer becomes familiar with the product he begins to identify many possibilities that were never in scope to begin with. Requirements hence will never be known in totality, and with time they continue to bloat, leading to the much disdained 'Scope Creep'/'Requirements Drift'. EMR vendor and the customer need to work in tandem over time to build a solution that will continuously solve the customer's problems. Service oriented architecture (SOA) should allow the product to be dynamically fine-tuned. Choosing an EMR is akin to marriage; due diligence in picking a spouse, followed by harmony amongst the couple post wedding, is an absolute need. It doesn't help (as is current practice) if it is done impulsively, akin to going on a date. Either way, the secret of success in a marriage lies in both spouses working in harmony once in a relationship, the same works in HCIT.

Total cost of ownership for procuring, deploying, training end-users and keeping an EMR running can be high. With multiple departments competing to get a share of the limited funds in the system, failure is not an option for EMR deployment. When failure occurs, it reinforces the strong negative perception that IT/EMR doesn't work in healthcare.

Consequences of Choosing The Wrong EMR

Using the marriage analogy, if there is mismatch amongst spouses, unnecessary post-wedlock friction occurs, eventually leading to separation. After an EMR is rolled out, changing to a different vendor is like changing the tyres of a moving bus. Change Management issues are so big that it

leaves the end users frustrated and cheated, bringing bad name to all HCIT.

**Key Adoption and Integration Challenges in EMR**

UI/UX has until recently not been a priority in IT, even more so in Healthcare. In one of the most demanding, multi tasked, zero-fault-tolerant environment that healthcare is, expecting clinicians to play clerical roles does not help. IT systems have matured in the office space over last three decades; they have entered other niche areas only recently. Industry is adapting to clinician demands, but much work needs to be done using voice recognition (VR), pattern recognition (PR), artificial intelligence (AI), natural computing (NC), data extraction from free text (HL7 CCD-continuity of care document) in order to help the busy clinician who is mostly mobile with both hands preoccupied. This is a far cry from office usage where one sits at a desk and types using a keyboard, which evolved from typewriters no too long ago. Like Steve Jobs clearly understood and transformed the entertainment user with his iPad/iPhone simplicity and ease of use (they actually carry no user manual), both hardware and software needs to adapt to healthcare. Change management and end user buy-in cannot be an option if success is expected. Management ownership and a top down approach have shown better HCIT adoption rates globally.

Integration was never a need when computers were dumb machines churning data in silos. After communication/ethernet/intranet/internet arrived on the scene users naturally found it strange that these machines and software did not permit communication. Interoperability is so complicated and intricate that it has spawned a new industry in both hardware and software. Clinical terminology is the alphabet in which the healthcare language is written, HL7/DICOM/LOINC etc. ensure interchange between systems, HL7 CDA (clinical document architecture) provides the framework to write sentences/paragraphs and convey the clinical story. Changing old systems to work on modern standards is too expensive a proposition, thereby spawning the interoperability industry, allowing start-ups to quickly build products on Lean, Agile, and FastWorks principles. Health information exchanges (HIE) have started appearing, which enable data flow between disparate systems of multiple generations, technologies and versions.

**EMR Interoperability Standards – Government Leadership**

The National Knowledge Commission (NKC) was an eGovernance advisory body to the Prime Minister of India and existed for five years from 2005 to 2008. The need for digital transformation of healthcare was identified and a recommendation for a health information network (HIN) was made in 2007. Indian Health Information Network Development (iHIND) encompasses three vistas, in which this transformation had to occur:

ü NHP – National Health Portal (to provide health education & information)

ü NEMS – National Emergency Medical Services

ü HIN – Health Information Network

**NHP**

In January 2013 Prof. Dr. Supten Sarbhadikari was appointed as Director for
Centre for Health Informatics for National Health Portal, Govt of India.
The NHP is expected to provide unbiased, reliable health education and health information using multiple delivery mechanisms. A subtle distinction between health education and information needs to be highlighted here; community medicine/public health education would fall under its remit as opposed to details of medical conditions, practitioners in a specific locality, etc. that will fall under information. Though portal/internet is the primary mode of delivery, they also create content to be delivered on mobile, television, print media.

**NEMS**

India has multiple EMS providers with as many call numbers across the length and breadth of India. It can be very confusing and challenging to know which number to call in case of an emergency, especially if one is new to an area. 100, 101, 102, 800,108, 104, 1098 etc. are examples of this diversity. To save precious time in a medical emergency there is a dire need to synchronise these numbers, eventually having a single number to call that can map internally to the locally relevant EMS number. This is being done by the Telecom Regulatory Authority of India.

**HIN**

A health information network is envisaged wherein a patient is the owner of his data and has access to it whenever and wherever he needs it. India was looked upon as 600 districts and a single district taken to design the network. Infrastructure, capacity building, workforce to man the posts, EMR interoperability standards for seamless data flow have been researched, and an optimum choice made by a team of seasoned medical informaticians, with practical implementation experience from across the globe. Funding has been identified to run an urban and rural pilot as a proof of concept (PoC) before scaling it up India wide. The Health Secretary of the government of India in her wisdom rightly identified EMR interoperability standards as the lynch pin to get this juggernaut rolling. A committee of experts was invited to study major HCIT implementations globally and standards to recommend an initial set. This work was completed in 24 months with the Ministry of Health and Family Welfare (MOHFW) finally announcing the standards on its website. It is now mandatory for Govt. RFP/Tenders to adhere to the EMR standards as published, and eHealth tender in Kerala is the first to adopt it.

The Health Secretary of India subsequently formed the 'EMR Interoperability Standards' expert committee to study global EMR interoperability

standards and identify the ones which are relevant to India. Snomed CT (SCT), ICD10, DICOM, LOINC, NIC/NOC, NANDA, HL7, CCD/CCR (continuity of care document/ record), HL7 CDA (clinical document architecture) are some of the standards that that have been recommended by the committee. These standards were released by the MOHFW in August 2013 and are now mandatory in all Government RFP/Tenders.

SCT, the most comprehensive clinical terminology, was recommended to be made available to India by the same committee. After much debate and deliberation India joined the International Health Terminology Standards Development Organisation (IHTSDO) in April 2014 by paying for a national license . The complex nature of this standard was envisaged early and Centre for Development of Advanced Computing – Medical Informatics Group CDAC-MIG, Pune, tasked with building a software development kit SDK to facilitate easy adoption. They have since released the SDK in public domain in July 2014. The Central Buearu of Health Intelligence (CBHI) is the nodal agency and national resource centre with a senior bureaucrat, Nikunja Dhal IAS, appointed resource person. SCT is now freely available to anyone in India, including commercial vendors. A detailed project report has now been commissioned to rollout eHealth across India, with significant funding provided by the government in 2014.

**The Missing Pieces/Challenges Ahead**

This mammoth task is not without challenges; some of them being clinical leadership, standards, connectivity, privacy and security, user needs/resistance to change, ICT and domain knowledge, IT security and sustained funding. The HCIT workforce is non-existent today and needs to be addressed on a war footing, if the crores of rupees that will be spent on deploying HCIT solutions across India are to be utilised effectively. Nursing informatics Specialists (NIS) are a dedicated cadre that have been groomed in AIIMS Trauma Centre New Delhi, who own the HCIT implementation; this maybe a successful model to replicate countrywide. HCIT needs to be a profitable business, with clear distinction between products and services. The legal framework needs to be in place before large deployments can start. The existing IT Act 2000 addresses financial transactions only; clearly the needs of healthcare are much more complex. Data privacy, confidentiality, secondary use of data on the lines of HIPAA needs to be defined.

**Conclusion**

India, with its huge population and socialist healthcare model where a market driven approach is still evolving, is a perfect platform for HCIT deployment. The software prowess that she has earned can be harnessed under the sage guidance of the National Knowledge Commission and the National Institute for Smart Governance to transform healthcare delivery and make the WHO vision of 'Health for All' a reality.

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