Cellular Operators Association of India

TELEMEDICINE

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Contents

EXECUTIVE SUMMARY

India has a vast population, 70% of which lives in villages which often have difficult or inaccessible terrain. This makes deployment of medical facilities a great challenge. India also has one of the lowest per capita healthcare spending by the Goverment at USD 32 while developed countries have a per capita healthcare spending of USD 4,590 by Goverment. The spending of private sector on health care is about 1.5 times the government spending, but these healthcare facilities are concentrated in the urban areas.

Given the current scenario, telemedicine becomes a high potential tool to bridge the gaps in healthcare in India. In 2007 revenue from the Indian tele-medicine market stood at USD 50mn. According to BCG telecom enabled services market, including tele-medicine, in India would be USD 200 bn by revenue and it will generate 40 mn new jobs by the year 2020. The opportunity provided by tele-medicine is too large to ignore.

India already has a few significant m-health initiatives like **m-dhil** which provides healthcare information to the general Indian public mainly through text messaging, **m-Pedigree** has created a mobile platform to track and check the validity of medicines, **e-Healthpoints** a network of modern clinics that offer telemedicine, clean water, diagnostics, and safe drugs and **World Health Partners** a multi-level service delivery network which leverages the latest in telemedicine and point-of-care diagnostic technology.

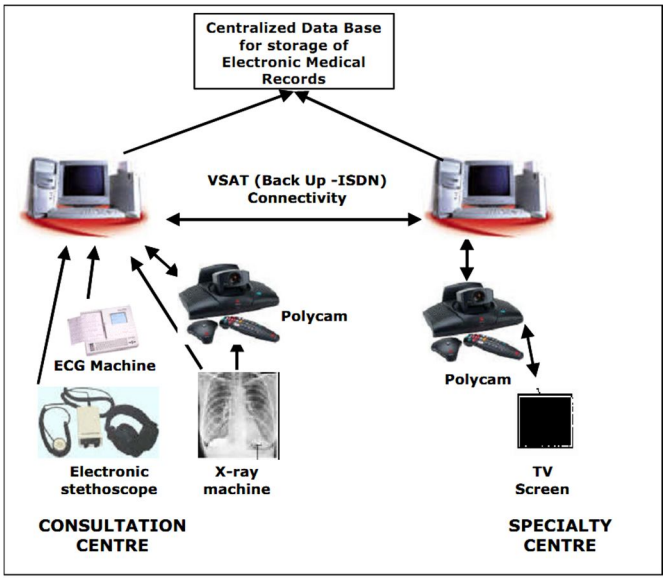
There needs to be a continuous effort from both government and private players to deploy tele-medicine and help develop the ecosystem of telecom equipment manufacturers, software vendors, diagnostic techniques and drug delivery to realize the full potential of tele-medicine.

INTRODUCTION TO TELEMEDICINE

According to World Health Organisation, telemedicine is defined as, "The delivery of healthcare services, where distance is a critical factor, by all healthcare professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for continuing education of healthcare providers, all in the interests of advancing the health of individuals and their communities".

Telemedicine is not a specialty but a tool which uses Information Communication Technology (ICT) and clinical medicine. It is a subcategory of a wider Tele-health care category which includes applications like fall detection, bed monitoring, panic alarm etc. Telemedicine has enormous potential to meet the challenges of present medical infrastructure mainly capacity and delivery of healthcare. This is especially relevant in rural and remote locations where the delivery of health services is a major concern.

Telemedicine is practiced on the basis of two concepts real-time i.e. **synchronous** and **store-and-forward** and home health i.e. **asynchronous**. Real-time telemedicine requires presence of both parties at the same time and a communication link between them that allows real-time interaction and data transfer between the two parties. Store-and-forward methods acquire and store medical data e.g. medical images, bio signals in a database or storage location and can be accessed by medical specialist at a convenient time. Simultaneous presence of both parties is not required.



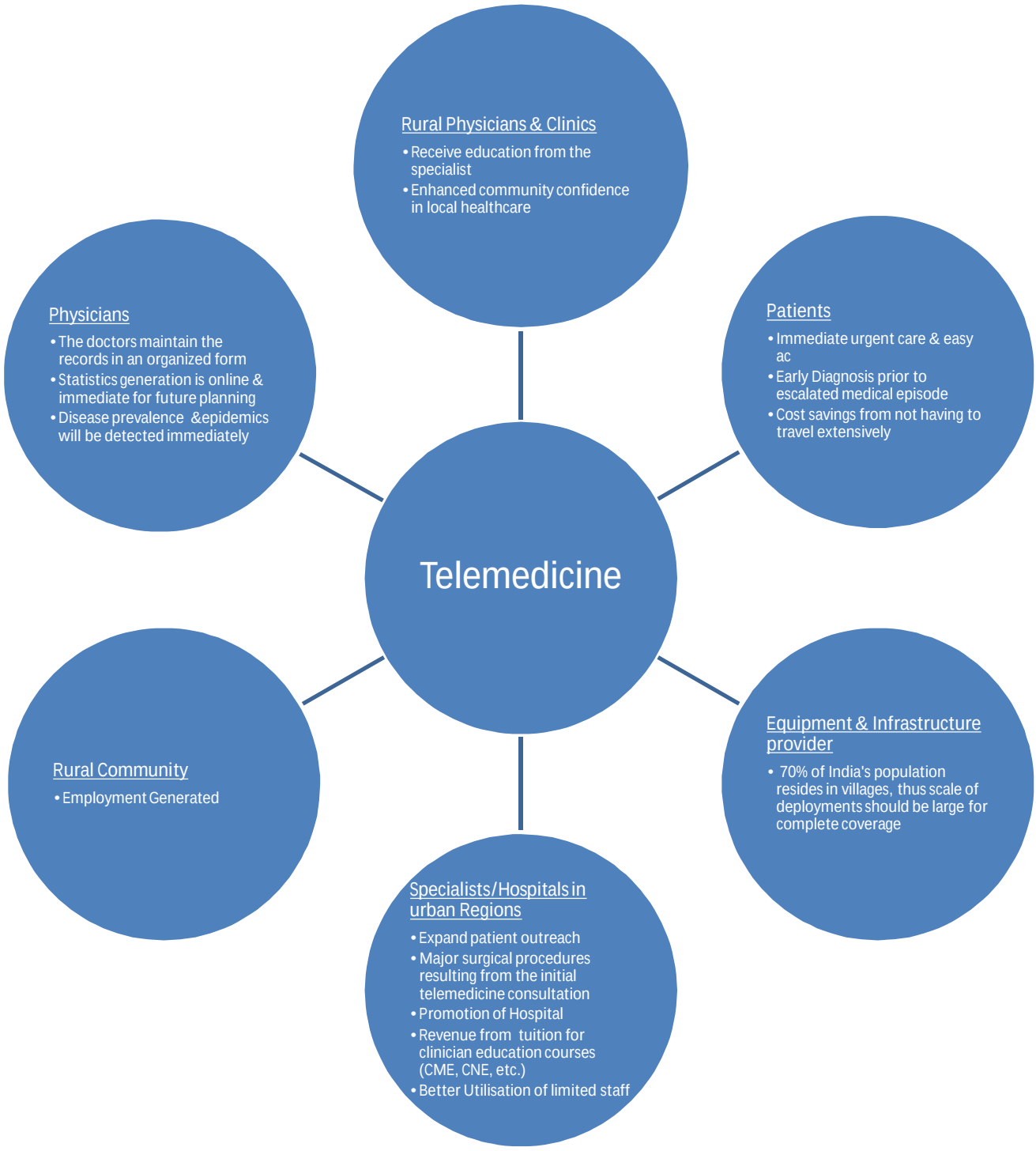
Source: A Telemedicine Platform: A Case Study of Apollo Hospitals Telemedicine Project

Typical Tele-Medicine Network

Telemedicine covers five major health processes:

1. **Monitoring**: Includes both home bound and mobile health monitoring. Devices remotely collect and send data from homebound or remotely located patients to a monitoring station for interpretation. The data may include patient's vital signs, ECG and blood glucose. Such services can supplement the use of home visiting nurses or patients under general observation. It could help save both trained human resource time and bed space, which is extremely valuable.
2. **Diagnosis**: whereby devices examine a patient and a connected physician residing in another location virtually examines and treats a patient.
3. **Triage**: a central point, office or call center staffed mainly by nurses that provides basic health instructions and information but no diagnosis or consultation. These could act as traffic control and regulation points like reception areas in a hospital albeit from a remote location.
4. **Consultation**: wherein a doctor can advise a patient at home or in a distant location or two doctors in different countries consulting one another.
5. **Procedure**: these are real-time medical procedures carried out in real-time. These range from simple to implement procedures like psychiatry to complex invasive robotic surgeries.

BENEFITS OF TELEMEDICINE



TELEMEDICINE WORLD OVER

Telemedicine has generated a lot of interest world-wide. Its ability to expand the reach of medical facilities without physical transportation of patients or medical practitioners, address capacity, trained resource and distance problem and also save cost has been discussed, researched and piloted world-wide. Regions like Mexico where the doctor patient ratio is bad and commuting a problem are enthusiastic advocators for adoption of telemedicine.

Few telemedicine projects have been:

Smartphones for medical diagnosis : Research from the University of Calgary's Faculty of Medicine shows that doctors can make a stroke diagnosis using an iPhone application with the same accuracy as a diagnosis at a medical computer workstation. This technology can be particularly useful in rural medical settings. This allows for real-time access to specialists such as neurologists, regardless of where the physicians and patients are located. In April 2010, the application was approved by Health Canada so Canadian doctors can now legally make a primary diagnosis using the device.

Remote medical diagnosis via 3G network under trial in Egypt: On 21st April 2011, Qualcomm announced that it is working with Egyptian mobile network, Mobinil to test a remote tool to enable dermatologists to use Mobinil's 3G network to diagnose skin conditions remotely.

Mobile phones to the rescue for pregnant women: Pumwani Maternity Hospital, in the impoverished Nairobi neighborhood of Eastlands, is the site of a trial project using mobile phones to help HIV-positive mothers avoid passing the virus on to their children. The project kicked off in December 2008 and is expected to end in mid-2013.

IBM platform for telemedicine: In Denmark, the costs of universal medical care are shared by the nation and its municipalities. Aarhus, Denmark's second-largest city has long used visiting nurses and other professionals to monitor chronically ill persons living at home. In a three-month pilot program, Aarhus recently replaced these onsite visits with remote care monitoring enabled by IBM's Personal Care Connect solution (PCC), a standards-based open infrastructure platform for remote monitoring. PCC consists of a data collection component designed to capture biomedical information at the point of generation (typically, in the patient's home); a server that normalizes and stores the data collected; and an application programming interface that presents the normalized data.

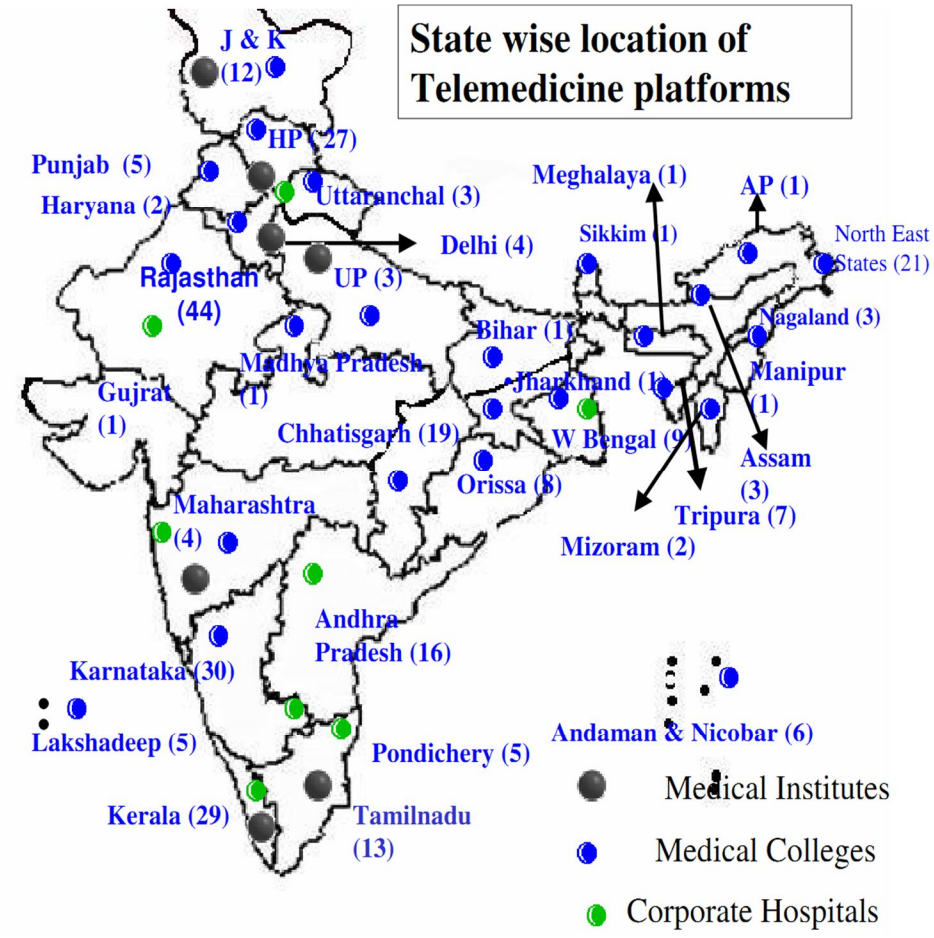
PCC is built to be scalable, reliable, financially practical and protective of patients' privacy. Important to this solution is an in-home hub that links medical devices to the PCC server. In its

pilot programs, IBM has typically employed Bluetooth-empowered cell phones to act as these hubs. IBM has also used Bluetooth to provide communications between the medical devices and the hub.

Consumer-driven healthcare will gather momentum in 2011 as the public takes more responsibility for its own health, with technology playing a key role, according to Ovum. In a new report, Ovum states that devices such as smartphones and tablet computers will help to drive the commercialization of healthcare next year, by allowing the public to monitor health and prevent illness.

TELEMEDICINE IN INDIA

India has a huge platform for implementation of telemedicine. All medical institutes, medical colleges and corporate hospitals in the country can be used as telemedicine hubs.



Source: www.telemedindia.org

In India, telemedicine programs are actively supported by Department of Information Technology (DIT), Indian Space Research Organization (ISRO), NEC Telemedicine program for North-Eastern states, Apollo Hospitals, Asia Heart Foundation and State governments.

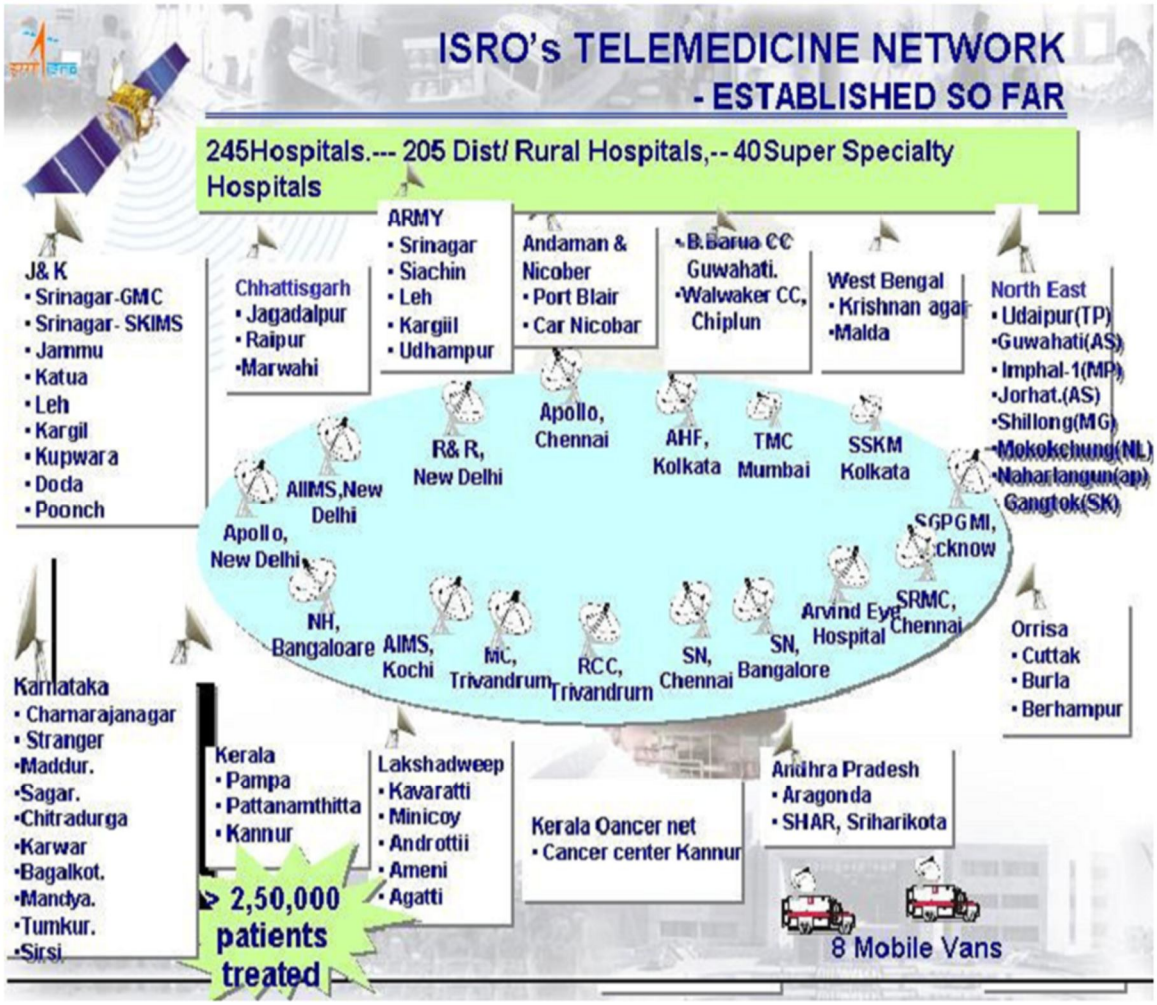
DIT, which acts as a facilitator with the long-term objective of incorporation and effective utilization of Information Technology (IT) in all major sectors, has taken the following leads in Telemedicine:

1. Development of Technology

2. Initiation of pilot schemes-Selected Specialty, e.g. Oncology.
3. Standardization initiative, by recommending guidelines and standards for practice of telemedicine in India

A telemedicine software system has also been developed by the Centre for Development of Advanced Computing, C-DAC which supports Tele-Cardiology, Tele-Radiology and Tele-Pathology etc. It uses ISDN, VSAT, POTS and is used to connect the three premier Medical Institutes of the country (viz. All India Institute of Medical Sciences (AIIMS), New Delhi, Sanjay Gandhi Post Graduate Institute of Medical Sciences (SGPGIMS), Lucknow and Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh). Now it is being connected to include Medical centers in Rohtak, Shimla and Cuttack. The telemedicine system has been installed in the School of Tropical Medicine (STM), Kolkata and two District Hospitals. In West Bengal, two hospitals where telemedicine centers have been established are the First Coronary Care Unit inaugurated in Siliguri District Hospital, Siliguri, and West Bengal on 24 June, 2001 and Bankura Sammilani Hospital, Bankura, West Bengal inaugurated on 21 July, 2001.

In the past three years, **ISRO** telemedicine network has expanded to connect 45 remote and rural hospitals and 15 super specialty hospitals. The remote / rural nodes include the offshore islands of Andaman and Nicobar and Lakshadweep, the mountainous and hilly regions of Jammu and Kashmir including Kargil and Leh, Medical College hospitals in Orissa and some of the rural / district hospitals in the mainland states. The Telemedicine project is not for profit. Project sponsored by Rabindranath Tagore International Institute of Cardiac Sciences (RTIICS) Calcutta, Narayana.



Source: www.telemedindia.org

ISRO Telemedicine Network

In order to strengthen the academic activities further, India has initiated a new project of Tele-education in hospitals to share academic programmes and live surgery transmission with other institutions using videoconferencing equipment and ISDN lines. Sir Ganga Ram Hospital enjoys a highly privileged reputation for being academically oriented, with the recognition of DNB (Diploma Of National Board) courses and good academic records of its students. At present, they have DNB courses for 28 specialties recognized by the National Board of Examination, New Delhi. Over the years, the standard of these training courses at the hospital serve as a benchmark and a model for other private institutions.

Public private Partnership to ensure uniform, accessible, affordable & equitable healthcare for rural masses. Catalysed & supported by Department of Science & Technology, Government of India New Delhi.

The Apollo group of hospitals was a pioneer in starting a pilot project at a secondary level hospital in a village called Aragonda 16 km from Chitoor (population 5000, Aragonda project) in Andhra Pradesh. Starting from simple web cameras and ISDN telephone lines today, the village hospital has a state-of-the-art videoconferencing system and a VSAT (Very Small Aperture Terminal) satellite installed by ISRO (Indian Space Research Organisation). Coupled with this was the Sriharikota Space Center project (130 km from Chennai) which formed an important launch pad of the Indian Space Research Organization in this regard.

Installed in 2002 by Narayana Hrudayalaya, Bangalore, Karnataka the Asia Heart Foundation Telemedicine initiative it has achieved a figure of more than 2000 tele-cardiology consultation through an enterprise based network. Escort heart institute & research center project, installed in 2002 has been involved in tele-cardiology service.

With the support of ISRO, Shankar Nethralaya at Chennai and Meenakshi Eye mission at Madurai has launched Mobile Tele-ophthalmology service.

Online Telemedicine Research Institute has been involved in R&D activities in telemedicine hardware and software and has been successfully executing projects of ISRO and DIT with turnkey approach.

Sr. No	Hospital	Project Details	Commenced
1	All India Institute of Medical Sciences (AIIMS), New Delhi	Connecting primary health care units to secondary and tertiary level hospitals	2005
2	Sanjay Gandhi Post Graduate Institute of Medical Sciences (SGPGIMS), Lucknow	Connecting primary health care units to secondary and tertiary level hospitals	1998
3	Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh	Connecting primary health care units to secondary and tertiary level hospitals	2005
4	Medical centers in Rohtak, Shimla and Cuttack	Connecting primary health care units to secondary and tertiary level hospitals	2010
5	School of Tropical Medicine (STM), Kolkata	Connecting primary health care units to secondary and tertiary level hospitals	2002
6	Coronary Care Unit, District Hospital, Siliguri, and West Bengal	Tele-cardiology	2001
7	Rabindranath Tagore International Institute of Cardiac Sciences (RTIICS) Calcutta, Narayana.	Tele-cardiology	2000
8	Apollo Group of Hospitals	Tele-cardiology	2001
9	Asia Heart Foundation	Tele-cardiology	2002
10	Shankar Nethralaya, Chennai	Tele-ophthalmology service	2001
11	Meenakshi Eye Mission, Madurai	Tele-ophthalmology service	2009

Hospital Information And Management System (HIMS) In India

Majority of the hospitals in the country are rooted in manual processes, which are difficult to access. The insurance sector demands for more efficient information storage and retrieval. Automation alone can help hospitals to meet these challenges. Many sturdy, standard HIMS solutions have been developed by the major IT companies e.g. Centre for Development of Advanced Computing (CDAC), Wipro GE Healthcare, Tata Consultancy Services (TCS) and Siemens Information Systems Ltd (SISL) etc. Currently most of the corporate and some government hospitals are deploying HIMS. CDAC, an autonomous government IT organization developed and deployed the first total HIS software in collaboration with SGPGIMS, Lucknow.

Telemedicine solutions were being actively used in India during the Kumbh Mela at Allahabad and Gujarat quake. There are continuing projects involving SGPGI Lucknow, the IAF station in Bhuj and AIIMS consultations to the population in Leh**.**

Many tele-compatible products like ECG. PFT, Uroflow meter, Dicom compatible X-Ray machine etc. are available for use in conjunction for a telemedicine center. Video conferencing is also available so that the direct patient to specialist interaction is enhanced.

Patient record keeping software is available in India. These are not only faster than writing, but better looking aesthetic reports are generated with records available all the time. If all records of patient can be kept on the computer, the same quality of health care will be available in all the corners of our country saving on travel and time off work.

A meeting of minds has taken place. After all, a computer is required for sending the records and a doctor who keeps his records on a computer just needs to send the same record for a consultation as and- when required for a specialist's opinion.

KEY DRIVERS FOR TELEMEDICINE IN INDIA

India is a vast country with an area of 3.28 mn km sq. and population of more than 1210 mn. We face capacity, trained medical resource and last mile coverage problems. According to estimates by the Planning Commission, India is short of 6 lakh doctors and 10 lakh nurses. This has led to a doctor to patient ratio of about one is to ten thousand. Such low ratios also do not make medical care affordable. The shortage is more pronounced in our rural communities as the majority of the doctors live and practice in cities. This when considered in the light of the fact that India has more than 6.38 lakh villages becomes a problem of greater proportions. The population to bed ratio in India is one bed per 1,000 people while the WHO average is one bed per 300.

Shortage of Nurses	Shortage of Doctors	Population to bed ratio – India	Population to bed ratio-WHO
10 lakh	6 lakh	10000:1	300:1

Source: http://presidentofindia.nic.in/sp010309.html

To combat these problems various state governments have come up with local solutions. To tide over acute dearth of doctors in remote areas, Andhra Pradesh launched a mobile health programme. Vans equipped with basic medical tools and skilled paramedics visit rural parts of the state to provide instant relief to patients. Karnataka has rolled out 104 ambulance services which are mobile health units catering to 90 far flung places in the state. But these efforts are isolated and far in between.

Presently the health delivery system in India is divided into three levels primary, secondary and tertiary.

Level	**Public**	**Private**
Primary	PHCs* and its sub-centers	Private Practitioners
Secondary	District hospitals	Small private hospitals and nursing homes
Tertiary	Teaching hospitals	Nursing homes and Corporate hospitals

*PHC – primary health care

Telemedicine can be used as a solution to bridge the gaps prevailing between the primary and

tertiary level health care system within country and across the continents. Realizing the potential of telemedicine and to serve the motto of health for all, Government of India is planning many telemedicine networks in which the primary and secondary level hospitals will be connected to a tertiary level hospital. SGPGIMS, Lucknow, a tertiary level medical institution is connected to 3 secondary level medical colleges in Orissa state and 2 primary level district hospitals in Uttarakhand and one in Uttar Pradesh under different projects sponsored by various government agencies and state governments.

Telemedicine is a solution that addresses all three problems i.e. capacity, shortage of trained medical resources and distance problems.

CHALLENGES FOR TELEMEDICINE IN INDIA

Some factors that might inhibit the growth of telemedicine if not addressed properly are:

1. **Policy and Financial Factors:**
    a. Reimbursements: Presently most insurance policies reimburse for medical treatment subject to admission in hospital. Insurance policy and regulations will need to be amended for patients availing benefits of telemedicine.
    b. Service Payments: How professionals get paid for services rendered needs to be resolved for telemedicine to become a popular tool.
    c. Financial Justification: Before vendors and infrastructure providers invest in the project policy framework needs to be defined to incentivize the deployment of telemedicine equipment.
2. **Legal Issues:**
    India does not have any legal guidelines defined in telemedicine which could lead to legal issues.
3. **Clinical Resistance:**
    a. Implementation of telemedicine is a process change and will require change in organization culture and structure. Resistance from medical staff for the adoption of new processes could impede the adoption of telemedicine.
    b. Training would be required for medical and support staff.
4. **Infrastructure Issues:**
    a. Although information technology has reached in all corner of the country but the accessibility to people living in remote and rural area to the nearest health center (PHCs, CHCs or district hospital) may not be easy due to poor infrastructure of road and transport.
    b. Deployment of telemedicine services infrastructure like regional network with high speed, electronic patient record system and system for electronic prescriptions need to be deployed.
    c. Interruption in power supply may limit the benefits of telemedicine.

5. **Ethical Issues:**
    Use of telemedicine would use technology for health information exchange (HIE), computerized patient record (CPR) and electronic medical record (EMR). These records are stored in databases and need to be maintained by a third party entity. Medical records are highly confidential information and need to be protected.

6. Technology Readiness:

Till now India has not seen any large scale deployment of telemedicine. Pilot projects have been isolated and small scale. Technology readiness for large scale implementation of telemedicine has not been tested.

Some healthcare professionals have doubt about the quality of images transmitted for tele-consultation and tele-diagnosis. In tele-radiology, telepathology, tele-dermatology the quality of image (colour, resolution, field of view, etc) should be international standards to avoid any wrong interpretation and mis-diagnosis. The delay in transmission of data may be of critical importance in tele-mentoring and robotic surgery and have to be reduced to the minimum.

MOBILE – HEALTH IN TELEMEDICINE

M-health leverages mobile devices and information communication technology (ICT) to deliver health services and information exchange which can increase access, affordability, and quality of healthcare significantly.

The number of global mobile phone subscribers in 2007 was estimated at 3.1 billion of an estimated global population of 6.6 billion (47%). These figures are expected to grow to 4.5 billion by 2012, or a 64.7% mobile penetration rate. The greatest growth is expected in Asia, the Middle East, and Africa. In many countries, the number of mobile phone subscribers has by-passed the number of fixed-line telephones, this is particularly true in developing countries.

In India, mobile penetration rates have increased markedly, by far the greatest growth rates are found in urban areas. India's mobile subscriber base rose to 787.28 million at the end of December 2010, up from 723.28 million in September 2010, according to the latest figures from the Telecom Regulatory Authority of India (TRAI), which revealed that mobile penetration reached 63.22%. So, mobile phones may have the potential to provide greater healthcare access to a larger portion of a population than currently accessible.

One of the first major m-Health initiatives was taken by Apollo Hospitals, using telemedicine to make secondary and tertiary medical expertise available to rural and peri-urban India through an audiovisual enabled delivery system. Qualified doctors are scarce in these areas and telemedicine has filled an important demand supply gap. From the year 2000 to 2009, over 57,000 tele-consultations were performed across various disciplines, from sexual health to neurology. Apollo is now offering 24/7 consultations for just INR 45, the equivalent of $1, and has 71 telemedicine centers across India. Due to the success of the program, the Delhi government is looking to expand the program in the near future in a public private partnership.

Some of the significant m-health initiatives in India are:

1. **m-dhil** – This Bangalore start-up provides healthcare information to the general Indian public mainly through text messaging, but increasingly through mobile web and digital content. With a paid subscriber list of over 250,000 users, m-Dhil is becoming somewhat of a WebMD for the Indian market.
2. **m-Pedigree** – Started in Ghana and now also operating in India, m-Pedigree has created a mobile platform to track and check the validity of medicines in order to combat the rampant practice of drug counterfeiting.
3. **e-Healthpoints** – Operating currently in Punjab, e-Healthpoints is creating a network of modern clinics that offer telemedicine, clean water, diagnostics, and safe drugs to peri-

urban Indians. They recently partnered with Proctor & Gamble to scale 2000 e-Healthpoints across five north Indian states.

4. **World Health Partners** – This non-profit has created a multi-level service delivery network which leverages the latest in telemedicine and point-of-care diagnostic technology to improve access and quality of care to rural and peri-urban India. They are scaling from Uttar Pradesh to Bihar through funding from the Gates Foundation.

5. **NETRA** – Still in the research lab at MIT's Media Lab, NETRA (Near-Eye Tool for Refractive Assessment) combines an external eye piece with software loaded on a smart phone to measure refractive conditions (i.e. near/far sightedness and astigmatism) on site at an extremely reduced cost. Optometrists in the US pay up $8000 for a similar device, and which is always located in optometrists' office. This technology could be a game changer for rural India.

Along with the growth of m-Health entrepreneurship in India, groups like the m-Health Alliance, which is a partnership between the Rockefeller Foundation, United Nations Foundation, Vodafone Foundation, GSM Association, and PEPFAR, plan to spread the m-Health gospel by setting up an India branch, as well as lead specific projects related to maternal health that already in the planning stage. Health 2.0, which organises conferences around the latest IT-enabled health solutions in the US, has plans to come to India in to start fanning the Indian m-Health flame. M-health India is gaining momentum.

Efforts are ongoing to explore how a broad range of technologies, and most recently m-Health technologies, can improve such health outcomes as well as generate cost savings within the health systems of low- and middle-income countries. In some ways, the potential of m-Health lies in its ability to offer opportunities for direct voice communication (of particular value in areas of poor literacy rates and limited local language-enable phones) and information transfer capabilities that previous technologies did not have.

Mobile network operators in India have already taken initiatives towards providing tele-medicine services. Vodafone has tied up with Blackberry towards a "BlackBerry-Vodafone Telemedicine Services" initiative at Nanavati hospital in Mumbai. The service enables users to access ECG reports directly on their handsets.

Airtel has developed a "mHealth umbrella" of services, one of the services is " MobiHealthNews" a SMS-based health "packs", the content for which is developed by mdhil and Indiagames.

Uninor has launched a health information dissipation application 'Wellness World' to provides information on health and welness related issues.

Aircel, in association with the Apollo Hospitals Group has introduced the 'Aircel Apollo Mobile HealthCare' facility offering telemedicine and Tele Triage services to customers. Under the telemedicine service, patient data is collected through various processes and is stored and shared between healthcare professionals to diagnose, treat and follow-up. Tele Triage is a solution to manage patient's health concerns and symptoms via a telephone-based interaction by doctors. This service provides structured medical advice and a disposition based on the symptoms. The service is available around the clock from qualified Apollo Clinicians.

Overall, mobile communication technologies are tools that can be leveraged to support existing workflows within the health sector and between the health sector and the general public.

COMMENTS

Telemedicine has been trumpeted as the great health care hope for rural India, a technology that can transform the health status of remote India and medical practice in the country. The unanswered question is: has it been able to achieve this yet; if not, can it?

Telemedicine in India can be a health innovator and affect real change in the medical scenario of our country if done well, using multiple hospitals and centers in the country, and on a large scale.

In order to do this, the Government, via ISRO connectivity, should connect up all district and village level hospitals to the closest tertiary care centers. The private sector can be used effectively and every private hospital can be connected to one remote site thus distributing the load of patients, rather than a handful of hospitals linking up to all the remote sites.

Technologies for telemedicine designed by innovative majors (such as Cisco technologies) should be low cost, easy to install and use and should be able to work on low cost bandwidths. Public interest campaigns to increase awareness of the benefits of telemedicine would help. A standardized training program for all telemedicine providers and users would be helpful in ensuring the link ups occur rapidly and the centers stay connected without the network going down.

A viable model wherein a small cost is paid for the telemedicine consultation would make this a long term successful model of health care delivery. An appointment system that allows patients to book their 'doctor visit' rather than have to wait for a doctor would help improve usage of the system. Also a 'pusher' is needed in every telemedicine center to ensure that after the link up is done; the telemedicine link is actually used on a daily and sustained basis. And finally, data collection on daily utilization, diagnosis made and treatment plans changed would help to measure success and impact and provide direction for the future.

FUTURE PERSPECTIVE

India, with its diverse landmass and huge population, is an ideal setting for telemedicine. Telemedicine activities were started in 1999. The Indian Space Research Organization has been deploying a SATCOM-based telemedicine network across the country since that year. Various government agencies—Department of Information Technology and Ministry of Health & Family Welfare, state governments, premier medical and technical institutions of India—have taken initiatives with the aim to provide quality healthcare facilities to the rural and remote parts of the country. The Government of India has planned and implemented various national-level projects and also extended telemedicine services to South Asian and African countries. Efforts are taking place in the field of medical e-learning by establishing digital medical libraries. Some institutions that are actively involved in telemedicine activities have started curriculum and non-curriculum telemedicine training programs. To support telemedicine activities within the country, the Department of Information Technology has defined the Standards for Telemedicine Systems and the Ministry of Health & Family Welfare has constituted the National Telemedicine Task Force. There are various government and private telemedicine solution providers and a few societies and associations actively engaged to create awareness about telemedicine within the country. With its large medical and IT manpower and expertise in these areas, India holds great promise and can emerge as a leader in the field of telemedicine.

CONCLUSION

Widespread adoption and diffusion of telemedicine in India remains a mission that is yet to be accomplished. So far the IT healthcare industry's worth in India is USD 100 million (Rs. 410 crore) (CAGR = 18 percent) and IT adoption in healthcare has been pegged at 5 percent (which is dismally low by any standards). Accordingly, the telemedicine component in this USD 100 million (Rs. 410 crore) IT healthcare industry is nominal (because healthcare IT also includes computerization of hospitals).

While, we do not claim that telemedicine will solve all (or even most) of India's healthcare problems, we believe that it is a starting point to offer important contributions to combating such problems using IT and related technologies. There is unarguably much more to be done for India to enjoy higher capabilities that telemedicine can offer, such as remote surgeries (tele-surgery). We believe that as India continues to develop its telemedicine infrastructure, especially with continued government support through subsidies to private telemedicine initiatives, its upward trend in healthcare will continue. And we are confident that this will post India on the path better the quality of life for all Indians across spectrum of socio-economic strata and irrespective of their life-cycle stage.