Asian Pac. J. Health Sci., 2015; 2(1): 60-68 e-ISSN: 2349-0659, p-ISSN: 2350-0964

A Review study on utilization of Telemedicine and e-Health services in Public Health

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ABSTRACT

The use of technology to deliver health care from a distance, or telemedicine, has been demonstrated as an effective way of overcoming certain barriers to care, particularly for communities located in rural and remote areas. The use of advanced technology to deliver healthcare at a distance has the potential to be one of the defining medical revolutions of the 21st century. In India, it has been observed that there is a great deal of disparity in quality and access to healthcare between urban and rural regions. This healthcare divide needs to be bridged since most of the Indian population live in rural areas. Telemedicine is emerging Information and Communication enabled health technology which has the potential to facilitate access to healthcare in underprivileged population if absorbed into existing healthcare delivery system. The scale of e-health services in India has been very small so far considering it's size, mostly limited to medical transcription, health awareness through portals, telemedicine, hospital management system and customer service using the internet. Both government and private agencies are venturing into Tele-health care by providing hardware and software solutions. Tele-health industry is coming up and policy and standard issues are getting addressed. Government efforts are directed towards setting up standards and defining IT enabled healthcare infrastructure in the country.

Keywords: Telemedicine, e-Health, tele-education, human resource

Introduction

Information and Communications Technology (ICT) includes other technologies utilized for telemedicine and telehealth applications, such as remote monitoring devices, electronic clinical equipment, and other emerging technologies used to improve the health of peoples. [1] The use of Information and Communications Technology in the field of health is not new. For example, telemedicine, using videoconferencing, began in the 1950s.

However, the use of telemedicine grew rapidly in the 1990s due to the increased availability of low-cost, high-quality computers and high-speed Internet, as well as the development of new technology tools to support high-quality and efficiently delivered health care.[2]

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Such applications rely on a high speed Internet connection, or broadband. Broadband refers to a high-speed, always-on connection to the Internet, which enables information to be transferred with very little delay in receiving or sending.[3]"Telemedicine" is the practice of medicine using electronic communications, information technology. This information Technology provides health care services at a distance. A closely associated term is telehealth, which encompasses a broader definition of remote healthcare that includes nonclinical services, such as patient education, disease self-management, and medical training for providers.[4] Telemedicine and telehealth utilize ICT to provide a wide array of health services to individuals without requiring the individual to interact face-to-face with the health care provider delivering the care. In addition, telemedicine can ease the gaps in providing crucial care for those who are underserved, principally because of a shortage of sub-specialty providers.[5]In addition, telemedicine can ease the gaps in providing crucial care for those who are underserved, principally because of a shortage of sub-specialty providers. Telehealth is a special type of health information

technology that holds considerable promise for enhancing the provision of care in rural communities. Telehealth is defined as the delivery of health care services at a distance, using information an communication technology.[6]Telemedicine also uses an ever-growing menu of software and technological devices, including videoconferencing equipment; digital cameras; electronic clinical devices, such as digital stethoscopes; and disease management and health education software. Telemedicine is utilizes wireless devices, such as cell phones and Personal Digital Assistants, to exchange data. Common applications of telemedicine and telehealth include videoconferencing between a patient and health care provider for a consultation or among groups of patients or providers for education, support, and care coordination; transmission of data, such as x-rays, photographs, video, and audio files; remote monitoring of vital signs and other health indicators; and Internet applications for patient education and disease management. Telemedicine interactions often occur between two health care sites, such as a clinic and a hospital. Physicians can even attend to emergencies from their homes, using ICT, instead of or before going to the hospital to care for a patient. [7]Telemedicine is essential in expanding the availability of health care, improving patient experience and outcomes, and addressing the affordability of care. Telemedicine enables the implementation of new models of care delivery to improve access to health care, such as virtual practice groups, which are networks of providers who are available to consult with patients or their providers via telemedicine.[8]The use of this wearable/portable embedded physiological and cognitive monitoring system will enable a medical team to closely monitor patients without bringing them into a hospital or a specialty care center. This real/near-time monitoring could enable a healthcare team to address patient problems before they require major intervention in a specialty care center. This monitoring can be ideal for managing chronic conditions such as diabetes, hypertension, and cardiovascular disease and has been shown to reduce hospitalization and, in some cases, reduce mortality rates.[9, 10,]The collection and integration of patient data could also be used by medical teams to tailor patient educational sessions that address actual observed patient conditions. Moreover, these patient education or consultation sessions can now be delivered directly to patients via their smart phones. The vision of providing tailored medical care and services to remote patients is exciting and offers the promise of better and more effective healthcare. This potentially patient-centered approach and convenient access to healthcare services offered over a wireless network will undoubtedly change patients' expectations of their healthcare system and service providers. This readily available information network will also change society's expectations of our medical system. It will become a standard of care to offer and deliver proactive patient educational/ informative sessions. These sessions could be face to face and in person, but economics will probably favor distributed text or video messages tailored to the specific needs of the individual patient. The often mentioned medical home will, in most likelihood, be a virtual medical home distributed over a secure wireless network accessible by the patient and his/her healthcare team regardless of who is part of the team today or where the patient is located.The standardized platform and operating systems of mobile platforms coupled with the ability to collect and manage large distributed data sets opens the way to not only targeted health care to individual patients but to targeting health care to entire populations. Through the application of data mining and data fusion techniques along with anonymous geographical information, we may be able to monitor a disease as it emerges and migrates across our nation. Distributed systems that monitor body temperature could be used to track probable influenza outbreaks, and examining consultations for nausea and diarrhea could help identify a contaminated food distribution chain. Given the ability to collect and use unprecedented amounts of patient and population information in near real-time presents opportunities unimagined 10 years ago. In addition to offering the healthcare community a better way to serve our patient population, this ability to capture and use data poses real and imagined risk. The medical and the telecommunications industries will have to develop plans and policies to protect individual patients from privacy violations, particularly with issues surrounding access to medical information, confidentiality and security. Methods of ensuring privacy such as controlled access, encryption and authentication can and must be employed to assist in securing and protecting privacy of medical data. Telemedicine technology is largely effective tools and based on specific use cases with certain specialties' use of telemedicine advancing faster than others.[11]Marcia M.*et al*; (2014) suggested in their study that the departments/programs that were using at least one telehealth service (a single department/program within a hospital may have implemented more than one telehealth service). The largest (15.7%) of operational telehealth implementations are in radiology departments (including MRI, CT, EKG, EEG, and ultrasound), with a substantial number in emergency/ trauma care (7.5%), and cardiology/stroke/heart attack

programs (6.8%). Between 3% and 4% of hospitals had operational telehealth implementations in specific other departments, namely psychiatry, critical/intensive care, neurology, or obstetrics/gynecology/NICU/pediatrics departments. All other departments accounted for 2.5% of hospital operational telehealth implementations.

In this study a large number of hospitals, urban hospitals, and academic medical centers were more likely than rural and critical access hospitals to implement telehealth in cardiology/stroke/heart attack programs.[12]However, the technology involved in telemedicine allows providers and patients to be almost anywhere.

Telemedicine in India

India is a vast country with more than one billion population still struggling to improve it's poor health parameters. Almost 75% of the population resides in rural areas lacking access to medical expertise and infrastructure. With a huge disparity between urban and rural infrastructure telemedicine enable health services holds a great promise. Government-supported healthcare delivery follows a three tier system and is a primary responsibility of the state. The potential of telemedicine technology in providing healthcare access to rural populations and far-flung areas has long been realized, and many technical ministries of the Government of India such as Information Technology, Science & Technology, and Space have been experimenting with telemedicine pilot projects since early 2000. Based on the successful outcome of these pilots, the Ministry of Health and Family Welfare has now adopted telemedicine into the National Rural Health Mission, an initiative focused on improvement of the rural healthcare delivery system.

All across the country, several telemedicine initiatives have been taken up by both government and private sector organizations with federal and state funding.

Hospital Information and Management System (HIMS)

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. 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, autonomous governments IT organization developed and deployed the first total HIS software in collaboration with Sanjay Gandhi Post Graduate Institute of Medical Sciences (SGPGIMS), Lucknow in 1998.

Tel-health Care Services

Healthcare is a state subject which follows a three tier system – primary health centers catering a group of villages, secondary level health care located at district level and medical college hospitals constituting the tertiary level healthcare located in the big cities.Besides, there are few advanced medical institutes of national importance having clinical, teaching and research facilities in various super-specialties.In this country and abroad have proved the technical capabilities of telemedicine in satisfactory transfer of knowledge and information pertaining to patient care, professional and skill development of healthcare providers and administrators from tertiary level through secondary to primary level. This will not only educate the doctors but also improve the quality of patient care at these levels. Both government and private agencies are venturing into Tele-healthcare by providing communication link, Hardware and software solutions for telehealth care.Department of Information Technology(DIT) and Ministry of Communication and IT (MCIT) Government of India.Some of the successful telemedicine pilot projects implemented by DIT in various states are the telemedicine network in West Bengal for diagnosis and monitoring of tropical diseases, the Oncology Network in Kerala and Tamil Nadu, the network for specialty healthcare access in rural areas in Punjab, Maharashtra, the hilly state of Himachal Pradesh, and the North-Eastern region. DIT also established links among the three premier institutions, namely, The Sanjay Gandhi Postgraduate Institute of Medical Sciences (SGPGIMS), Lucknow, All India Institute of Medical Sciences (AIIMS), New Delhi, Post Graduate Institute of Medical Sciences (PGIMER), Chandigarh using ISDN & Satellite connectivity which in turn connected to the state level hospitals.[13]For diagnosis & monitoring of tropical diseases in West Bengal using Wide Area Network (WAN), developed by Webel (Kolkata), Indian Institute of Technology, Kharagpur and School of Tropical Medicine. Kerala Oncology Network for providing services for cancer detection, treatment pain relief, parient follow-up and continuity of care in peripheral hospitals of regional Cancer Center , (RCC), Trivendrum. A Telemedicine solution to provide specialty health services to remote areas of north-eastern states of India at Naga Hospital Kohima and remote states of Mizoram and Sikkim with support from Marubeni India Ltd., Govt. of Nagaland and

Apollo Hospital, Delhi.To standardize services of different Telemedicine centers a document, "Recommended Guidelines & Standards for Practice of Telemedicine in India", has been prepared by DIT2 which is aimed at enhancing interoperability among the various Telemedicine systems being set-up in the country. These standards will assist the DIT and state governments and healthcare providers in planning and implementation of operational telemedicine networks. To established a telemedicine center standard should be set for telemedicine system, software, connectivity, data exchange, security and privacy issue etc. Guidelines should be made to conduct the telemedicine interaction. In collaboration with National Informatics Center (NIC), Community Information Centers (CICs) were setup initially in 30 blocks of the North Eastern states and Sikkim using NICNET.

Indian space research organization (ISRO)

ISRO's satellite-based Telemedicine network through Indian Satellite System (INSAT), which started in 2001 under the GRAMSAT (rural satellite) program now includes 315 hospitals: 271 remote/rural district hospitals/health centers connected to 44 super specialty hospitals located in major cities. Ten mobile tele-ophthalmology units are also part of this network. This has been implemented in the remote areas of northeastern states of Tripura, Nagaland and in the southern state of Karnataka in its tribal belt. District hospitals of Andaman and Nicobar Islands are linked to specialty hospitals in mainland India.ISRO1 is deploying telemedicine nodes under GRAMSAT (rural satellite) programme. In collaboration with state governments it has established a Telemedicine Network consisting of 225 Hospitals-185 Remote/Rural. District Hospital / Health Centers connected to 40 super specialty hospitals located in the major states. More than 2,25000 patients have been provided with tele-consultation and treatment under ISRO project.

Ministry of health & family welfare (MOH&FW)

MOH&FW has implemented Integrated Disease Surveillance Project networking of all district hospitals with medical colleges of the state to strengthen the public health system, particularly focusing on disease surveillance. It has now adopted telemedicine into the National Rural Health Mission, aiming at providing healthcare access to the rural population, National Rural Telemedicine Network (NRTN) Project, and has launched tele-ophthalmology pilot projects in many states under the National Blindness Control Program.[14]

1. Distant Medical Education

Advancement in Telecommunication and Information technology provides an opportunity to bridge the knowledge gap by networking academic medical centers of excellence with peripheral medical colleges to practice distance learning in the form of interactive virtual class room, teleconference of operative procedures, accessing library, web enabled teaching activities etc. The scenario in India is no different from any developing country. Considering the recent availability of enormous bandwidth from existing space and terrestrial telecommunication infrastructure, Information technology professionals, necessary hardware and software, and the emerging technology of grid computing, the country is now in a position to afford such kind of network.

2. Research and Development

Though telemedicine application projects have been undertaken in many states in the country, research and development has not grown in that proportion.

3. Capacity Building

Apollo telemedicine network foundation in collaboration with Anna University, Chennai has started a 15 days certificate course in Telehealth Technology which is a blend of technical, medical and managerial skills.[15]SGPGIMS, Lucknow in collaboration with the State and Central Governments and Ministry of Information Technology has taken up the initiative and set up a School of Telemedicine and Biomedical Informatics in its campus. This 2500 sq. meter building will house different laboratories in the field of e health such as Telemedicine, Hospital Information System, Biomedical informatics, Medical multimedia and image management, Medical Knowledge Management, Artificial Intelligence, Virtual Reality and Robotics. The objectives of the school are creation of various resource facilities, structured training programme, research and development, providing consultancy to government and private healthcare organizations , collaboration with technological and medical universities in the country and abroad. Currently SGPGIMS is providing training in networking, technical, managerial aspects and application of telemedicine to man power involved in Orissa, Uttaranchal and Raibareli telemedicine projects. SGPGIMS has also submitted a project to the DIT to support creation of laboratory infrastructure to carry out interdisciplinary research in the field of Health IT.

This project is aiming at creation of a resource center at national level to attract researchers from various fields of science related to health information science and technology to develop research collaboration. This National Resource Center is going to function in the School of Telemedicine and Biomedical Informatics.

4. Tele-health Industry operating in India

Technically India is now self sufficient in meeting the need of hardware, software, connectivity and services. Industries providing hardware and software supports are Apollo Telemedicine Network Foundation, Hyderabad; Online Telemedicine Research Institute, Ahmadabad; Televital India, Bangalore, Vepro India, Chennai and Centre for Development of Advanced Computing.

5. State Governments of India

Various states, now realizing the advantages and benefits of telemedicine technology in modern-day healthcare delivery, are cooperating with the central government in establishing statewide telemedicine networks to strengthen the healthcare facilities in their states. Some have also started owning the projects and integrating them into their health system.

6. Academic Medical Institutions and Corporate Hospitals

SGPGIMS, a premier academic institution in the public sector, started telemedicine activities in 1999 with funding support from various government agencies. The institute is now networked with 24 national and international partner institutions and has been carrying out tele-education and telehealth activities. Various departments have integrated telehealth and tele-educational services. Two other premier institutions of India, the AIIMS, New Delhi (linked with hospitals in Jammu and Kashmir, Haryana, Orissa, and North Eastern states) and PGIMER, Chandigarh (linked with 20 district hospitals of Punjab and Himachal states) have been leaders in telemedicine programming and dissemination. Sri Ramachandra Medical College (SRMC), Chennai (linked with 35 national and international nodes), Tata Memorial Hospital, Mumbai (linked with 30 nodes) Christian Medical College, Vellore are also involved in similar activities.In the corporate sector, the major players are the Apollo Hospital Group (linked with 64 nodes), Amrita Institute of Medical Sciences (AIMS), Kochi, Asia Heart Foundation (AHF), Bangalore (telecardiology and mobile van), Fortis Hospital, New Delhi , Narayana Hrudayalaya, Bangalore, and Escorts Heart Institute and Research Center. Sir Ganga Ram Hospital (SGRH), New Delhi has launched its telemedicine centers in Haryana and Rajasthan states.[16]

7. Mobile Telemedicine

With the support of ISRO, Shankar Nethralaya at Chennai, Meenakshi Eye Mission, and Aravinda Eye Hospital[15] at Madurai and four other corporate eye hospitals have launched mobile teleophthalmology service for early diagnosis and treatment of ophthalmic diseases under National Blindness Control Program. [13,14,17,18,19].

8. Mobile tele hospitals

SGRH, AIMS, SRMC, and AHF have launched mobile telehospitals for rural access of specialty healthcare services. Andhra Pradesh state government has launched mobile clinics that would daily visit two villages to check health parameters of people and also carry out telemedicine through "104 services."[20] In Maharashtra, BPL Mobile has launched the value added service to provide a virtual channel that will give subscribers instant access to quality medical assistance, real-time interaction with doctors anytime and anywhere.[21]

9. e-medicine scheme

Gujarat government's health department has announced an e-medicine scheme for rural areas.

Global Telemedicine Projects Initiated by India

The Ministry of External Affairs (MEA) has undertaken a global telemedicine initiative in Africa and South Asia to extend its telemedicine- enabled healthcare and educational services under a South Asian Association for Regional Cooperation (SAARC) and Pan- African e-Network Project.

SAARC Telemedicine Network

The SAARC, created as an expression of the region's collective decision to evolve a regional cooperative framework, received a major impetus during the 14th SAARC Summit held in New Delhi in April 2007.[22]

Pan-African e-Network Project

The MEA is implementing this project through Telecommunications Consultants India, Ltd. (TCIL) to establish a VSAT infrastructure for 53 African Countries of the African Union by a satellite and fiberoptic network that would provide effective tele-education, telemedicine, Internet, videoconferencing, and voice over Internet Protocol services. Ten super specialty hospitals in India have been identified to provide telehealth services to 53 remote African hospitals. [23]

e-Learning in the Health Sector
Two government agencies, National Informatics Center (NIC) and Indian Council of Medical Research (ICMR), have established the Indian Medical Literature Analysis and Retrieval System (MEDLARS) Center to cater to the information needs of the medical community of India. This ICMR-NIC Center for Biomedical Information has developed various Web-based modules such as a union catalogue of journal holdings of medical libraries of India (http://uncat.nic.in), a bibliographic database of Indian biomedical journals (http://indmed. nic.in), and full texts of Indian biomedical journals (http://medind. nic.in).[24]

Collaborative Knowledge Sharing
Toward professional knowledge sharing, premier academic medical institutions, namely, AIIMS, New Delhi, PGIMER, Chandigarh, SGPGIMS, Lucknow, Christian Medical College (CMC), Vellore and AIMS, Kochi are actively involved in sharing their academic activities over the telemedicine network.[25]

National Digital Medical Library Consortium
National Medical Library's Electronic Resources in Medicine Consortium is an initiative taken by the Director General of Heath Services (DGHS) to develop nationwide electronic information resources in the field of medicine.[26]

Med varsity
Apollo Hospitals Group, in association with NIIT Ltd., has launched Medvarsity to provide the platform for online delivery of continuing medical education and offers variety of courses for doctors, nurses, and other paramedical personnel.[27]

Rad Gurukul
Solutions, premier provider of teleradiology services, launched "Rad Gurukul," the teleradiology training center in Bangalore, to provide training and to refine the skills of radiologists, technologists, and IT personnel involved in healthcare IT.[28]

C-DAC MOHALI
C-DAC Mohali provides training to healthcare professionals to effectively use telemedicine solutions both on site and remotely through the use of telehealth equipment with the help of training specialists. This training will be helpful in implementation of electronic medical records, training and support for a telemedicine system, and doing technical assessments and business analyses.[29]

National e-Governance Action Plan
The Department of Information Technology, GoI has launched the National e-Governance Action Plan with the intent to support the growth of e-governance within the country. A separate "e-GovernanceStandards Division" has been created by the NIC to steer the process of evolving the standards.

Village resource center (VRC)
The VRC concept has been evolved by ISRO to provide a variety of services such as tele-education, telemedicine, online decision support,e-governance services, weather services, and water management. It will provide connectivity to specialty hospitals, thus bringing the services of expert doctors closer to the villages. As of now, 445 VRC nodes have been established in many states across the country.

e-Health Industry
The prominent Indian industries providing hardware and software supports are C-DAC, Pune, Mohali & Thiruvananthapuram; Apollo Telemedicine Network Foundation, Hyderabad; Online Telemedicine Research Institute, Ahmedabad; Televital India, Bangalore; Vepro India, Chennai; Prognosys Medical Systems Pvt. Ltd., Bangalore; Medisoft Telemedicine Pvt. Ltd., Ahmedabad; idiagnosis Technologies, Ahmedabad; Karishma Software Ltd., New Delhi; Neurosynaptic Communications Pvt Ltd., Karnataka; Amrita Technologies, Kerala; Larsen & Turbo, Mumbai; West Bengal Electronics Industry Development Corporation Ltd., Kolkota; and Space Hospitals Ltd., Chennai.[30]

Research and Development DIT initiative
DIT, along with its societies such as Center for Development of Advanced Computing (CDAC),[31] Media Lab Asia, and in collaborationwith many premier medical and technical institutions such as SGPGIMS, AIIMS, PGIMER, and Indian Institute of Technology, is involved in research, design, development, and deployment of advanced telemedicine products and solutions. They also specialize in embedded and VLSI technology, biomedical, electronics, telemedicine, and entrepreneurship development. It has also developed the institution-based, application-oriented telemedicine software systems "Mercury" and "Sanjeevani" and validated them at three premier medical institutions of the country.

Research Publications
India has contributed numerous research publications in peer reviewed scientific journals and book chapters

in related fields. A compendium of these publications can be found at the Telemedicine India Web portal.[32]

National Scientific Societies

The Telemedicine Society of India, The Medical Computer Society of India and The Indian Medical Association of Informatics are actively involved in organization of annual scientific meetings to develop awareness and providing a platform for sharing research experience in this emerging field of healthcare informatics[33-35].

Future Perspective of Telemedicine in India

The Government of India is planning and implementing various national level telemedicine projects and deploying mobile and fixed telecenters within the country to provide healthcare facilities to the remotest and poorly accessible areas of the country. ISRO telemedicine nodes are expanding and are also planning to launch a dedicated satellite, HEALTHSAT, for healthcare delivery. Encouraged by the success of the Kerala ONCONET project, MoH&FW is planning to implement the "OncoNET" India project, which will network 27 Regional Cancer Centers with 100 Peripheral Cancer Centers to facilitate National Cancer Control Program. NRTN is another majorinitiative coming up under National Rural Health Mission.[36]A major national initiative—the National Medical College Network Project is coming up in the field of e-learning—to establish a national telemedicine grid for networking all the medical colleges to implement the recommendation of the National Knowledge Commission. Few tertiary care academic medical institutes from different regions of the country will be identified as Medical Knowledge Resource Centers (Regional Hub), each of which will be connected to medical colleges (Nodes) in that region. One of these regional hubs will be identified as the Central Hub, which will have overall responsibility to coordinate the National Network in addition to providing infrastructure for the Central Content Development Center. Under DIT support, the National Resource Center for Telemedicine & Biomedical Informatics has been established at the School of Telemedicine and Biomedical Informatics, SGPGIMS, Lucknow. The Department of Information Technology is planning to launch various other projects in collaboration with government organizations: Development of a Web-Based Telemedicine System for Chronic Diseases, E-Health Visualization and E-Health Associated Field, Advanced ICT for Health Care, Proof of Concept Project in District by NIC State Center, Hyderabad and Access to Quality Healthcare in Tamil Nadu through a Pilot Telemedicine Network.[37]The National Knowledge Commission, which is a high-level advisory body to the Prime Minister of India, with the objective of transforming India into a knowledge society, is planning to develop the Indian Health Information Network.[38]In the international collaboration area, DIT is also collaborating with the European Union (EU) in various fields including e-governance and e-health. Bridging Europe's Electronics Infrastructure to Expanding Frontiers–Education and Research Network, India's project proposal, has also been approved under EU's FP6 IST program.[39]

Conclusion

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 noncurriculum 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 has emerged as a leader in the field of telemedicine. Telemedicine technology is getting familiar with healthcare providers in India. Some states have started adopting it but most of the applications are in project modes. It will take quite some time for diffusion of this technology into health delivery system. Technically the country has all the resources to face the need of the users. Broadband connectivity is widely available and the cost is coming down fast. Besides tele-healthcare this technology is used for

distance education and soon all the medical colleges may be linked which can bridge the deficiency of teachers and medical library facility. Most of the telemedicine projects are driven by the doctors and the success is entirely dependent on human rather than technical factors. Awareness among patients and health administrators is essential to accept this emerging technology as a facilitator for quality healthcare delivery in remote areas. There is a need to address policy issues like standardization, legal, ethical and social factors besides developing revenue models and creating infrastructure for meeting the need of training manpower and carrying out research and development. Though start up projects are successful, models should be developed to sustain it. Telemedicine technology can bring revolution to the field of medicine. Using a number of high-speed satellite and terrestrial telecommunications links, centralization and coordination of resources, and support of government, it has been possible to reach and access the Indian population spread out in heterogeneous geography and thus achieve the goal of health for all. India has taken a lead in this field among the developing countries. However, all the activities need to be evaluated in a national framework, and many issues, such as national e-health policy, and legal/ethical issues need to be addressed.

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Source of Support: NIL
Conflict of Interest: None