Special Section: Telemedicine in India

Telemedicine in India: The Apollo Story

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Abstract
The challenges faced and the methods implemented by the Apollo Hospitals Group in introducing telemedicine in the Indian setting are discussed in this article. Using Information and Communication Technology (ICT) to make available secondary and tertiary medical expertise to suburban and rural India was thought of as early as 1997. In March 2000, the world’s first Very Small Aperture Terminal (VSAT)-enabled village hospital was commissioned. Today, with 115 centers including 9 overseas, the Apollo Telemedicine Networking Foundation (ATNF) is the oldest and largest multispecialty telemedicine network. More than 57,000 teleconsultations in various disciplines, ranging from sexual medicine to neurosurgery, have been provided. Patients have been evaluated from distances ranging from 120 to 4,500 miles. A majority (85%) of these teleconsults were reviews. The successful proof of concept validation studies, carried out from 2000 to 2001 by Apollo, were instrumental in the Indian Space Research Organization (ISRO) including telemedicine as a major thrust area. The pioneering role played by Apollo is also discussed in using VSAT-enabled Hospitals on Wheels. The paper reviews the significant role played by ATNF in the growth and development of telemedicine in South Asia. Academic activities are also highlighted. The pioneering efforts in the field of m-Health, home telecare, the Pan African e-network project, starting the first formal educational course in telehealth and various other e-initiatives are elaborated.

Key words: Apollo Telemedicine, telemedicine in India

Introduction
The Indian healthcare industry is one of the biggest in the world, with every sixth individual on the planet a consumer. Interestingly, the private sector dominates, by providing 80% of the healthcare (5%–6% of the GDP). India needs to build at least 750 hospitals of 250 beds each, every year, to achieve the minimum standards stipulated by the World Health Organization. This involves recurring annual expenditure of $5 billion (USD).

Healthcare in India is a paradox. While we are becoming the next global health tourism destination, with world class centers of excellence, 700 million Indians have no direct access to secondary and tertiary medical expertise. The 70% of the population residing in rural areas have limited access to medical care because 80% of the doctors live in the metropolitan areas.

The Apollo journey commenced with a dream, a dream so powerful that it transformed the medical landscape in South Asia. The dream nurtured and grew with Dr. Prathap C. Reddy, the founder Chairman of Apollo Hospitals, who translated this vision into a reality. Apollo Hospitals started as a 150-bed hospital in Chennai, Southern India in 1983, amid much skepticism. India in the early 1980s was not the easiest place for a private enterprise. Dr. Reddy probably was aware of what St. Francis of Assisi had once remarked, “Start by doing what is necessary, then what is possible, and suddenly you are doing the impossible.”

As early as 1997, the Apollo Hospital Group decided to extend its outreach and initiated the process of providing healthcare to suburban and rural India using telemedicine. Today, with 10,000 beds, 44 hospitals, and 4,000 consultants in 50 specialties, it is no surprise that Asia’s largest healthcare provider also runs the oldest and largest multispecialty telemedicine network in South Asia. The birth and development of Apollo Telemedicine Networking Foundation (ATNF) is a saga in itself. The resounding success of ATNF served as a catalyst for others to join the bandwagon and make telemedicine in India a reality.
ATNF, a registered not-for-profit organization, today has 106 peripheral centers in India and 9 overseas including Colombo, Dhaka, Lahore, Maldives, Muscat, Lagos, Yemen, Sudan, and Kazakhstan. Centers in India extend from the Andaman and Nicobar Islands (1,100 miles from mainland India) to Mizoram in North Eastern India. The tertiary care facilities of Apollo Hospitals at Chennai, Hyderabad, Delhi, Ahmedabad, Kolkata, Bangalore, and Madurai, act as telemedicine referral centers. Telecamps enable a specialist to see several patients one after another. More than 57,000 teleconsultations have been provided through ATNF as of March 2009. These have covered many disciplines, ranging from sexual medicine to neurosurgery. Patients have been evaluated from distances ranging from 120 to 4,500 miles. ATNF strongly believes that telemedicine needs to be, and can be, integrated into the Indian healthcare delivery system, thus providing healthcare to the masses of India. ATNF utilizes telemedicine using appropriate hardware, software, and peripheral medical devices, to examine, investigate, monitor, and treat, with the patient and the doctor physically located in different places. Using Broadband Internet, ISDN lines or Very Small Aperture Terminal (VSAT), audio files, text data, images, and video can be transmitted.

Information and Communication Technology Scenario in India: An Overview

With a teledensity of 36% in March 2009 and an almost fourfold increase of mobile phones over land lines, the target of 200 million telephones in rural India by 2012 will probably be achieved earlier. Availability of telecommunication infrastructure in rural India is today becoming a reality (the rural teledensity in September 2008 was around 13%, which probably cannot be said of the availability of doctors and nurses). Recognizing this, the public and the private sector have realized that telemedicine could possibly be the solution to bridge the gap in health services between the “haves” and the “have-nots.” Today, there are approximately 550 telemedicine units located in suburban and rural India, seeking telemedicine consultation from specialists in almost 70 tertiary care hospitals. Providing a value-added service like telemedicine is indeed a mind-boggling exercise. The 500,000 teleconsults, which have probably taken place so far, helped us identify many technological issues for which corrective measures were instituted.

TELEMEDICINE: THE APOLLO EXPERIENCE

Patients visit Apollo Hospitals, quaternary care centers, from all parts of the country and overseas. Telemedicine is a cost-effective method for reviewing patients from far away. Over 57,000 teleconsultations have taken place through telemedicine centers set up by ATNF in the last 9 years. Eighty-five percent of these teleconsults are reviews. Facilities are available for tele-auscultation and for transmitting and viewing an echocardiogram live from a few centers. ATNF has custom-made a Web-based software (Medintegra), which is used by many peripheral centers in the network, to transmit electrocardiograms (ECGs), images (x-ray films, computed tomography [CT] scans, ultrasound pictures, MRI) and other reports. Centers that do not have access to broadband Internet use ISDN lines. The videoconferencing camera is focused directly onto an illuminated x-ray lobby. The images are viewed by the consultant at the tertiary center. Though attempts have been made to enforce standard operating procedures in the peripheral centers, this has not always been possible. Differences in language, educational levels, degree of involvement, differences in priority, and time constraints are some of the constraints. Interaction is not always in English. About six different Indian languages are commonly used.

A DAY IN THE LIFE OF APOLLO TELEMEDICINE IN CHENNAI

An office assistant ensures at 8:00 AM that computers and videoconferencing equipment are in working condition (Fig. 1). The list of scheduled teleconsultations is checked and listed on a white board, according to the appointments given. Facilities are available for three teleconsultations simultaneously. Most of the consultations take place between 1:00 PM and 5:00 PM. For review teleconsultations, the medical case records are obtained from the Medical Records Department. The teleconsultatns manually record the teleconsultations in the medical record. If the Web-based software cannot be used, prescriptions are sent as e-mail or faxed to the remote end, where a printout is handed over to the patient. All teleconsultations are recorded and stored in a secure computer. Prior consent of all those involved in the teleconsultation is taken. To ensure privacy, only the teleconsultant is present. However, at the remote end, the relatives and occasionally the telemedicine administrator are present to facilitate translation into English. Manual documentation acts as a backup. Though the telemedicine center at Chennai is equipped with a backup power supply, this is not always the case at the remote end. Occasionally, due to power issues, consultations are postponed. On several occasions, due to heavy downpour at the peripheral end, ISDN lines get inundated, which causes temporary loss of connectivity. Over the year, the necessity for punctuality has been instilled into the minds of the telemedicine administrators at the remote end, and almost 95% of the teleconsults take place on schedule. A miniconference with a seating capacity of 15 is used to
conduct departmental tele–grand rounds. Videoconferencing facilities are also available at the auditorium to accommodate a larger audience. Major space constraints inside the hospital have resulted in locating the telemedicine department, outside the main hospital building. Some consultants are unable to spare the extra time required for commuting. Hence, a desktop telemedicine solution is now being evaluated. In addition to this, intercontinental teleconsultations are now being given to nine countries of the African Union, through the Pan African e-Network project.

Clinical Telemedicine

Teleconsultations in a discipline depend largely on the enthusiasm of the consultant. Thus, teleconsultations may be lower in a specialty, even though the demand is higher. Dermatology is one area where telemedicine has been beneficial. Excellent photographs are transmitted from simple digital cameras, obviating the routine use of dermatoscopes. Patient satisfaction is found to be high. Psychiatry accounts for about 20% of the total teleconsultations. Time taken for each teleconsultation in psychiatry varies from 15 to 40 minutes. Nonavailability of specialists in rheumatology has contributed to the increasing use of telemedicine in this field. In 2008, rheumatology accounted for 20% of the teleconsultations. Similarly, sexual medicine is not available even in many tertiary hospitals. Over 600 teleconsultations have been given in this discipline alone, with gratifying results. Neurology and neurosurgery teleconsultations include detailed clinical examination for pseudoseizures, involuntary movements, parkinsonism, and myopathy (Fig. 2). In all cases, the specialist was able to carry out a tele-examination sufficient to guide the local doctor on how to proceed. A paramedical worker at the remote end elicits reflexes and the response is seen by the specialist. A movement disorder specialist can make an accurate diagnosis by reviewing the video. Several seriously ill head-injured patients were managed by the local general surgeon, including evacuation of an acute subdural hematoma, and excision of compound depressed fractures of the skull, with the confidence that online neurosurgical video teleconsultation is available. A large number of patients (2,285) with neurological afflictions (medical and surgical) who are living in remote areas have been evaluated through telemedicine. In all neurological and neurosurgical cases, the teleconsultant was able to give a definite opinion and guide the local physician. Some cases require management in a tertiary care hospital. Details of the treatment are discussed with the patient and the family, so that they are well informed and fully prepared (e.g., meningomyelocele, brain metastasis). Other cases such as tuberculosis and cysticercosis of the brain were managed by the family physician under the supervision of the specialist. These telediscussions are of considerable help. Teleconsultation was particularly useful in the follow-up of already treated patients.

The cost for a teleconsultation varies from $20–30 USD. This amount is used to defray the costs of transmission, costs at the peripheral center, costs at the specialist end, and the consultant’s professional fees. However, if a patient had to visit the hospital physically, he/she would have had to pay a minimum amount of $100–250 USD, toward travel expenses and accommodation.

The Aragonda Story: How It All Began

In 1998, a well-equipped secondary care hospital was built at the village of Aragonda, in the state of Andhra Pradesh, 250 miles from Chennai (Fig. 3). The 50-bed hospital was equipped with a CT...
scanner, an ultrasound scanner, echocardiogram, automated laboratory equipment, an incubator, treadmill test (TMT), pulmonary function test (PFT), endoscopy, and two operating theaters. A general surgeon, a pediatrician, and four family physicians completed the team. Emergency and trauma services were made available with one ambulance. The hospital now has 9 consultants, 5 residents, 37 nurses, 12 technicians: a supporting staff of 63. Every month about 250 inpatients are treated. About 4,000 operations have been carried out. In 1999, Apollo Hospitals and the Department of Space, Government of India, and Indian Space Research Organization (ISRO) embarked upon a novel initiative. For the first time in the world, a VSAT was made available in a village hospital, and teleconsultations were provided from Apollo Hospital Chennai through satellite technology.\textsuperscript{13}

Commissioning the world’s first VSAT enabled a modern secondary-care hospital in the village of Aragonda (Fig. 4). On March 24, 2000, U.S. President Bill Clinton said “I think it is a very wonderful contribution to the healthcare of the people who live in rural villages, and I hope that people all over the world will follow your lead, because if they do then the benefits of the Hi-tech medicine can go to everyone and not just people who live in big cities.”

A videoconferencing system and a VSAT supplied by ISRO were used to conduct the first proof of concept validation (i.e., that providing telemedicine to villages in India is feasible through satellite technology). In the last 9 years, 6,000 free teleconsultations have been given to the economically backward, in and around this village. Two hundred fifty echocardiograms were seen live, remotely from the village of Aragonda (Fig. 5). Every Tuesday morning, a tele–grand round takes place in which the superspecialists from the Department of Pediatrics at Apollo Hospitals, Chennai interact with doctors in the village hospital. Children with complex conditions get the benefit of expert advice. The junior doctors at the tertiary hospital in Chennai have an opportunity to study diseases occurring in rural areas. During the last 5 years, over 200 grand rounds have originated from Apollo Hospitals, Chennai. These continuing medical education (CME) programs have helped augment the standard of medical practice in Aragonda. Images of x-rays and ultrasound were scanned, compressed, and transmitted. ISDN lines were available as a backup. Digital imaging and communications in medicine (DICOM)-compatible CT images were acquired electronically and transferred to Chennai. Initially, most of the teleconsultations were offline store and forward. Subsequently, online real-time teleconsultations were scheduled. Provision was also made for emergency teleconsultations. Some cases required management in a tertiary care hospital. Details of the treatment were discussed with the patient and family prior to transfer to the tertiary hospital. Initial apprehensions about telemedicine being accepted as a modality to provide healthcare in a village setting were unfounded. All stake-
holders acknowledged the new ecosystem of healthcare delivery. Detailed evaluation of the socio-economic benefits and impact analysis needs to be done. What started as a proof of concept validation in 2000 has turned out to be a super success story. The 6,000 villagers in the region who had teleconsultations, their families, the doctors in the village hospital who are essentially having daily CME sessions, the city consultants who now know what rural medical practice is, and society as a whole have benefited. During the last 9 years, we have proved that “distance is meaningless” and that “geography has become history.” Aragonda served as a catalyst to energize the ISRO to provide VSATs for telemedicine. Today, 275 peripheral hospitals are connected to 55 superspecialty hospitals through ISRO’s satellite network. As a contribution toward providing quality healthcare to the needy sections of society, ISRO has provided the hardware, software, and dedicated satellite connectivity free of cost. This has been reciprocated by all tertiary hospitals (government and private), in the ISRO network by providing free specialist consultation. As the world’s first VSAT-enabled village to have telemedicine, Aragonda has indeed been an eye opener. What the world needs today is 100,000 Aragondas… Improbable—Yes. Impossible—No!

Medintegra Software

When a patient visits a peripheral center on the Apollo Network for consultation, Medintegra enables the capture of patient demographic information and medical history, including images. MedIntegra can also acquire images directly from medical equipment such as ultrasound, color Doppler, MRI, CT scan, and so on. Non-DICOM-compliant images can be captured in the DICOM format using Frame Grabber. Compressed medical images are sent sequentially from the peripheral center to Apollo Hospitals. Post Consultation Details (PCD) are transferred back to the peripheral center. The electronic medical record (EMR) of the patient along with PCD is stored on the Web with high security and can be accessed from anywhere by authorized individuals. The patient has an option of giving access rights to any of the specialist doctors registered with Apollo Telemedicine, to go through his/her EMR for reference.

The Next Step

In a multicultural diverse society, 1.2 billion strong, thinking out-of-the-box is essential, as no single solu-
Teledicine in India: Apollo Story

Teledicine can be applied universally. Providing well-equipped mobile hospitals was another pioneering initiative from the Apollo group (Fig. 6). As part of the Distance Healthcare Advancement Project, Apollo Hospitals along with Philips Medical Systems, ISRO, and a nongovernmental organization (NGO), The DHAN Foundation, created an ecosystem where quality healthcare was provided through a Hospital-on-Wheels (HoW). The HoW would go to different villages on predetermined dates. A NGO carried out preliminary studies, created awareness, and worked out the logistics with the villagers.

Using an ISRO enabled VSAT, real-time teleconsultations, through video conferencing (VC) equipment on the van, were provided by a specialist to the patient on-board the HoW. Images of x-ray films, ultrasound studies, ECGs, and echocardiograms were evaluated remotely. In the first 18 months of the pilot, 4,070 patients were screened at a village in Theni district, 90 km from Madurai, a city in Tamil Nadu in South India. The air-conditioned HoW has an x-ray machine, an ultrasound scanner, an echocardiogram, an ECG, a mini-biochemistry laboratory, microbiology collection facility, an examination couch, and a toilet. Laboratory tests include hematology, clinical pathology, biochemistry, and microbiology. Several patients were referred for tertiary care management. Satisfaction levels among the villagers were high. As a pilot project, the HoW was a win–win situation for the tertiary care hospital, which could increase its reach, for the rural population and for the healthcare delivery system as a whole. However, long-term sustainability would imply major subsidies and availability of health insurance. Many problems were encountered in establishing connectivity from the mobile van.

Educational Use of Teleconferencing

As early as 2001, ATNF participated in the 1st Arab International Conference on Telemedicine. Subsequently in June 2001, a paper on “Telemedicine as a tool for a more equitable distribution of health care delivery around the world” was presented virtually from Chennai at an intercontinental, live, multipoint conference. Videoconferencing is an inexpensive way of projecting state-of-the-art facilities available in India to a global audience. In August 2001, ATNF enabled a 2-hour teleconference with Fujita Health University, Japan. Since then, 148 regional, national, and international videoconferences in different medical specialties have taken place. These conferences augment the skills of the participants, change perspectives, and introduce global thinking. Surgical and pediatric tele-CMEs takes place every week. The specialists from Apollo tertiary care hospitals discuss various clinical problems, with the specialists and residents, in other hospitals in India.

Role of ATNF in Growth and Development of Telemedicine in India

ATNF has played a significant role in the growth and development of telemedicine in South Asia. ATNF is a member of the Standards Committee on Telemedicine, the National Task Force on Telemedicine, the Working Group on Telemedicine of the Planning Commission, and the Working Group of the South Asian Association of Regional Countries Committee on Telemedicine. ATNF has been selected by the Government of India for the Pan African e-Network project to provide teleconsultation and tele-education to the countries of the African Union. The crusade for popularizing telemedicine has included the presentation of more than 140 papers in regional, national, and international meetings. Over 45 articles have been published, including many in peer-reviewed journals and textbooks. ATNF played a significant role in the formation of the Telemedicine Society of India. Formal courses on Telehealth Technology are being

Fig. 6. DISHA—Distance Healthcare Advancement Project: Teledicine for Hospital-on-Wheels.
GANAPATHY AND RAVINDRA

jointly conducted by ATNF and Anna University. International conferences on telemedicine have been organized by ATNF. It has been the privilege of ATNF to have helped the Indian Army to set up telemedicine units in the southern and central commands.

Forage into M-Health

In a pilot effort called Gramjyoti, Ericsson India obtained a special license to use 3G spectrum in a pre-defined area, 100 miles from Chennai, to showcase the power of 3G and its role in providing value-added services. These included e-governance, e-education, e-entertainment, and m-Health. ATNF was instrumental in demonstrating that 3G technology could be used in transferring health information.15 Text, audio, and video data were transmitted on a real-time basis. It facilitated consultants at the Apollo Hospitals, Chennai to interact with patients in villages at the remote end. Using 3G, doctors at the tertiary hospital were able to clinically “examine” the patients, through a high-quality Web cam. Medical history was made available to the doctor. Live blood pressure readings and heart and respiratory sounds were transmitted. In several patients, ECGs were transmitted. In 240 patients evaluated, a clinical diagnosis could be made. Patient and doctor satisfaction were good. ATNF and Ericsson showcased the potential of 3G to facilitate healthcare in Bhutan and also in Bangladesh. A second pilot was conducted at Madurai District (State of Tamil Nadu in southern India), through Apollo Hospitals, where EDGE Technology was used to provide teleconsultation to a village, using a HoW. A chest x-ray film was taken on board the HoW. The film was processed and developed on board. The x-ray films were then mounted on an illuminated lobby inside the HoW, and using a 10-megapixel digital camera on a tripod stand, images were taken and transferred to a laptop computer (enabled with a wireless connection). Using compression software, each image of about 9 MB was compressed to about 600 Kb and was transferred to the doctor end-computer using File Transfer Protocol. Ultrasound examination was done on 20 female patients. As live video streaming could not be conducted due to bandwidth constraints and specific software unavailability, the video was recorded on CD. These videos were transferred to the laptop, compressed, and sent through the wireless network to the tertiary hospital. An internist at the hospital reviewed the medical history and was also able to carry out a reasonable clinical examination through a Web cam.16

Apollo Hospitals eventually hopes to make m-Health an integral part of the healthcare delivery system. This will ensure quality healthcare to suburban and rural areas.

Home Telecare

Home telecare systems will become necessary due to increasing numbers of elderly individuals living alone. Video visits are easier than home visits. With increasing availability of broadband in a domiciliary setting, the middle- and upper-class Indians who require healthcare can have access to home telecare. ATNF has embarked on pilot studies in this field. Patients who require constant and close monitoring are provided with a Multi-parameter Digital Acquisition Unit (MDAU). The MDAU connected to an Internet-enabled computer can record and transmit a 12-lead ECG, blood pressure, pulse rate, temperature, and heart and respiratory sounds. A Web cam facilitates a real-time two-way video interaction. The MDAU can also create individual medical records storing history, clinical findings, and investigations. Prescriptions generated by the doctor can be viewed and printed at the patient’s bedside. The prescription can also be sent simultaneously to the nearest Apollo pharmacy through e-mail, so that the medicines can be door-delivered.

Fig. 7. Pan African e-Network Project—Teleconsultation with Senegal.
Apollo Telemedicine in Africa

The Government of India, with a budget of over $150 million (USD), has established a satellite and fiberoptics-based Pan-African e-network. The network will primarily provide tele-education, telemedicine, Internet, videoconferencing, and Voice Over Internet Protocol (VOIP) services. The main objective of telemedicine service in this network is to share the expertise of Indian medical professionals in the field of healthcare with doctors in Africa. Apollo Hospitals, Chennai was the first to start providing teleconsultations and CME programs. Consultations have been initiated with Senegal, Nigeria, Botswana, Ghana, Gabon, Burkina Faso, Mauritius, and Seychelles in the first phase (Fig. 7). A state-of-the-art studio facilitates CME programs (Fig. 8). Feedback from the recipients is encouraging and holds great promise for the future.

Apollo’s Health Super Highway

Health Highway is a major project spearheaded by Apollo Hospitals in conjunction with IBM. It is a revolutionary and precedent-breaking initiative, with which healthcare institutions across the ecosystem will have an opportunity to provide better quality of care to patients, through use of a Health Information Network. The objectives include the creation of a “one-patient; one-medical record” framework, access to right information at the right time, and ensuring data-rich patient records with semantic interoperability to provide next generation of care (www.healthhiway.com). Long-term plans include integrating the Health Highway with ATNF.

Academic and Research Activities

The 12th International Conference of the International Society for Telemedicine and e-Health, in conjunction with the 3rd National Conference of the Telemedicine Society of India, was organized by Apollo Telemedicine in November 2007. Various ministries of the Government of India and ISRO supported the event. Over 300 Indian and 35 international delegates attended the workshop and conference. In a first-of-its-kind initiative, ATNF in conjunction with Anna University, Chennai offers a certificate course in Telehealth Technology. The first six courses have attracted over 150 participants. Six such courses have been conducted, with over 150 participants. A similar program is in the process of being initiated with Indira Gandhi National Open University, New Delhi. Several publications and presentations (International and National conferences) have originated from ATNF, in the field of telehealth. Papers on telemedicine are presented at regional, national, and international conferences. Four candidates have obtained degrees in Master of Philosophy (M.Phil) and Master of Administration (MHA) by submitting dissertations in telemedicine. For its project on VSAT-enabled Rural Telemedicine in a developing country, ATNF was awarded the Singapore Government Technology Award 2007–Runner-Up. ATNF is in the process of clinically validating several products for potential use in telemedicine.

Telenursing

Apollo Hospitals Group has recently introduced an innovative program of making available nurses in selected Apollo pharmacies to facilitate healthcare. It is proposed to link some of these pharmacies with nurses, to the nearest Apollo tertiary hospital, through a telemedicine setup. Here...
again, the nurse would provide clinical information to a doctor and the request for assistance. Trial runs have been carried out using domiciliary telemedicine equipment to monitor blood pressure, ECG, and pulse rate of poststroke patients. However, doctors were preferred at the hospital end instead of nurses.

Issues and Challenges in Implementing Telemedicine

- Acceptance of telemedicine by society, patients, family physicians, specialists, administrators, and the government;
- Designing cost-effective appropriate hardware and software connectivity;
- Running short-term courses to train the trainers and the users;
- Adequate reimbursement to teleconsultants to make the scheme attractive and viable; and
- Getting grants, subsidies, and waivers to introduce telemedicine in suburban and rural areas.

Conclusions

These tasks were not easy. Changing the mindset of the people was as challenging as getting funds and appropriate technology. India with its multicultural heritage and diversity is a paradox. The challenge today is not confined to overcoming technological barriers, insurmountable though they may appear. The implementation problems facing telemedicine in India are legion. It is our dream and hope that within the next few years there will be many more telemedicine units in many parts of India. Eventually a doctor should only be a mouse click away! Awareness of telemedicine must permeate throughout society. Telediagnosis has to be followed up by appropriate referrals for investigations and subsequent management. To achieve this, universal insurance is necessary.

Telemedicine is an excellent CME medium educating the non-specialist. The knowledge that a specialist is always virtually available does wonders for a rural physician’s morale. Though pilot projects have been launched, progress has been excruciatingly slow due to a paucity of capital infrastructure or perhaps more important the lack of commitment, involvement, and refusal to change the traditional mindset. Speaking different languages with different educational and socio-economic status, with varied access and knowledge of modern ICT, creating a uniform national telemedicine infrastructure with e-security and e-privacy in India for 800 million living in suburban and rural India, and 400 million living in urban areas, is more than a challenge. The presence of 36 official languages, varying literacy levels, and diversity in social, economic, technological, and telecommunication development, contribute to the complexities involved in introducing telemedicine in India. Conflicting values, norms, and interests are often encountered. In a multicultural society, ethical issues offer a challenge. The exponential growth in ICT, the plummeting costs, and the increasing awareness of telemedicine leave no doubt that telemedicine will certainly revolutionize healthcare delivery in India sooner rather than later.

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