e-HEALTH FOR ALL - IS INDIA READY?

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ABSTRACT

Over the last couple of decades, developments in the information and communication technology have made the most palpable impact on health care management all over the world. Newer terms like telemedicine, e-health, telehealth and digital health surfaced to encompass broad concepts like electronic medical records and hospital automation, telemedicine, e-learning in health sector, e-governance and so forth. Tele-medicine refers to the application of various telecommunication and networking systems in the delivery of appropriate health care to individuals without limitations of time or distance. It involves the speedy transmission of patient data related to consultations, diagnostic and therapeutic services, patient education and rehabilitative services among the providers, the consumers, the planners and researchers. The advantages range from reduction of travel time and expenses for the patient, optimization of resources, enhanced diagnostic and therapeutic quality, emergency management and early referral of critical cases, cost-effective delivery of specialized services (like follow-up after surgeries) and continued patient education and medical training. These novel concepts showed promising results in several pilot projects in India and now the time has come to apply them to the all corners of the country. In this review we tried to search all relevant published data on the introduction of e-health concepts, programs, and the initial results so far from such efforts both from the governmental and non- governmental agencies and analyze the barriers and their possible solutions and to finally answer if India is ready to deliver e-health for all.

Key words: e-health, telemedicine, e-medicine

SITUATION WORLD OVER

The present day medical graduates and practitioners in most countries are well-equipped with both e-skills and knowledge to take up e-medical practice. The database creation, storage, transfers and archival within a span of a few minutes have opened up new vistas for health information sharing and research. Web-casting, teleconferencing and live transmissions of surgeries or procedures to any corner of the globe have added new dimensions to the means of sharing and updating medical knowledge. Efficient health management systems have facilitated delivery of high quality care at lesser costs. With the implementation of newer communication and networking systems, several components of medical care like clinic appointments, in-patient services, and management of operation theaters, stores, laboratory and imaging services have allowed delivery of health care in a more effective manner with little chance for error or strain on time and manpower. Distance and location have become less relevant. High-tech home monitoring, electronic medical record maintenance, online health care services to patients and counseling results in saving time and the stress of personal appearance of the patient to the doctor's clinic.

Innovative medical gadgets like the ECG with several hundred channels or the pocket held ultrasound machine which can acquire hundreds of images simultaneously have enhanced the diagnostic capabilities of the primary care physician many

folds. The smart phones can diagnose arrhythmias and the medical images can reach an expert in no time either at his home or hospital through tele-medicine net-work. Emergency alert systems like wrist bands or neck pendants are now available for the elderly enabling them to lead independent and secure lives. These systems utilize tele-networking and GPS technology with which, in emergency situations, detect their location and a health care team can be immediately dispatched for help just by click of a button. Today's patients are much better informed and more prepared for the interview with their doctors due to numerous web-sites on health issues. Several disease specific social groups and support agencies are operating effectively through social net-working (e.g.-Hemophilia association, Spastic society etc.). Health-tips, diet and exercise advice are only one-click away anytime anywhere. Patients and doctors are also using media like 'what'sapp' in their smart-phones for consultations share of medical images and reports in a span of a few minutes. The health planners can access huge patient data accurately in a short span of time thereby facilitating effective health planning for the masses and the timely implementation of these programs.

SITUATION IN INDIA NOW

India, like most other developing nations, is facing several public health challenges like communicable diseases, malnutrition, and cardiovascular disorders. The diversity and heterogeneity of basic facilities and health care delivery mechanisms in different parts of this vast country is an area of concern for any nation-wide program. Several paradoxes and unresolved challenges still exist in the present health care system. While we boast of the recent launch of 'Tele-ICU' – an internet based ICU 24x7 Health Care in New Delhi[1]; there are several pockets in the country facing the everyday challenges of poor transport systems, poverty, illiteracy and large families. The doctor-population ratio in India has been worked to be around 1 per 2000[2]. The disparity in urban and rural doctor distribution is dismal. In the rural settings, it is as low as 1 doctor per 25000 people[3]. It is largely because, 68.8% of the population lives in villages[4] but only about 2% of doctors practice in urban areas[10]. About 75% practice in urban areas and 23% practice in semi-urban areas [10]. Many young medical professionals are reluctant to work in rural areas due to the challenges of ill-equipped hospitals in poorly accessible location with limited physical facilities. Telemedicine can be a potential answer to the herculean task of reaching the masses and delivering the basic health services to one and all.

TELEMEDICINE IN INDIA SO FAR

Telemedicine in India started with the inauguration of Apollo Arragonda Hospital in Andhra Pradesh in 2000[5]. Since then, Indian Space Research Organization (ISRO), Department of Information Technology-Government of India (DIT), Ministry of Health and Family welfare-Government of India, state governments, medical institutes in public and corporate sector have introduced several telemedicine projects[6] that have showed a promising future for telemedicine efficiently solving the problems of effective health care delivery in a vast country like India. By 2008, more than 500 telemedicine centers were linked with about 50 specialist hospitals[7]. Today the numbers are even higher with several success stories.

Some examples of major telemedicine projects are illustrated in Tables 1, 2 and 3. The Indian government has been tremendously supportive of these telemedicine projects. In the 11th Five Year Plan (2007-2012), Indian government had allocated 2000 million rupees for this purpose[5]. A Working Group for the development of Indian Health Information Network was set up by the National Knowledge Commission with the objective to design, develop and integrate electronic health care framework to improve public health, health research and delivery of health care[8]. With the help of Uttar Pradesh state government, SGPGIMS, Luck now has set up School of Telemedicine & Biomedical Informatics which is also recognized as a National Resource Centre by the DIT[8]. India is now moving into a leadership role by expanding its services beyond its borders by way of projects like SAARC telemedicine project and Pan-African e-Network Project (see table 2)[14] .

POTENTIAL BARRIERS TO THE PROGRAM

Introduction telemedicine on a nationwide scale in India is faced with a number of barriers and challenges.

1. Budget Allocation: The foremost barrier is lack of earmarked budget allocation. Though there is a progressive increase in health budget in successive annual budgets the bulk of this is spent for maintenance of basic health services, upgradation of infrastructure, medical education and research. There is no ear-marked allocation to e-health and telemedicine out of the limited resources.
2. Lack of infrastructure: many peripheral health centers lack dependable electric supply and basic infrastructure like telephones, computers and internet connectivity.
3. Trained personnel : There gross lack of trained personnel to manage the program

4. Need to establish Central control and regional coordination centers at state capitals

5. Legal and ethical issues to be discussed at length at various levels

6. There urgent need for formulation of guide-lines for appropriate use of e health

7. Patient awareness and acceptance through health education

A recently concluded international conference on 'Transforming Health care with IT' held at Hydera-bad (2012) highlighted several of these issues. It is indeed a herculean task for any government to set up a perfect e-health system in a vast country like India in a short time. A step-wise approach with proper prioritization is the only practical solution. The telemedicine centers can be opened in all metro and big cities in the initial phase and diversified to district head-quarter hospitals in phases. In the next stage extension of the facilities to community health centers from the district head quarter hospitals and integrating with the existing peripheral heath cen-ters and sub-centers can complete nation-wide network.

Table 1: Telemedicine projects in India by agencies

Agency/Institute Involved	Telemedicine Activities / Achievements	Website/ Reference
Ministry of Health and Family Welfare (MoH&FW), Government of India	Currently implementing Integrated Disease Surveillance Program Network (connects all district hospitals to medical colleges) Project phase: the National cancer network (OncoNET India Program) following the success of Kerala Oncology Network Program. OncoNET will connect 27 Regional Cancer Centers with 100 peripheral cancer centers National level teleophthalmology project Project phase: The Digital Medical Library Network The National Rural Telemedicine Network project under National Rural Health Mission. National Telemedicine Task Force on Telemedicine to evaluate e-Health in India	8, 12
Department of Information Technology (DIT), Ministry of communication and IT (MCIT), Government of India	1. Telemedicine standardization and practice guidelines 2. >100 nodes in collaboration with state governments especially Punjab, TN, Kerala, WB, Tripura. 3. Northeastern and Himachal Pradesh hilly areas for specialty care 4. Specialty hospitals with District/ Rural Hospitals 5. Development and application of Tele-Radiology- West Bengal 6. Telemedicine module for Tropical Medicine in West Bengal - Webel (Kolka-ta), IIT, Kharagpur and School of 7. Tropical Medicine, Kolkata 8. Telemedicine and Tele-health Education facilities in Kerala; 3 mobile tele-medicine units to cater rural population of Kerala and TN focusing on early detection and preventive medicine. 8. OncoNET Network - Kerala and Tamil Nadu States 9. Telemedicine network for Naga Hospital, Kohima with Apollo Hospital, Delhi	8, 12
External Affairs Ministry	Pan-African e-Network Project The South Asian Association for Regional Cooperation (SAARC) Telemedicine Network Projects 10 super specialty hospitals will provide tele-health services to 53 remote African Hospitals	8,14
Indian Space Research Or-ganization (ISRO)	Nationwide network Many State level telemedicine networks established with collaboration between ISRO and the State Governments. Jammu & Kashmir, Andaman & Nicobar Islands, Lakshadweep Islands, North eastern states are also connected through telemedicine network by ISRO About 10 Mobile teleophthalmology facilities for rural areas are available 382 hospitals connected in telemedicine network. 306 Remote/Rural/ District Hospitals/ Health Centres and 16 mobile telemedicine units are connected to 60 Super specialty Hospitals located in major cities	www.isro.org

Table 2: Contribution to Telemedicine by Institutions in Public sector

Agency/ Institute Involved	Telemedicine Activities / Achievements	Website / Reference
Sanjay Gandhi Post Graduate Institute of Medical Sciences (SGPGIMS), Lucknow	1.Application project, SAARC Telemedicine project, IDSP project 2.Consultancy, project planning and implementation of network in states- • Networked 21 national and international partner nodes. • Connected to several centers like AIIMS, PGIMER AIMS. • 2003-2009: 3medical colleges in Orissa • 11 NE states, besides Uttaranchal, Almora, Srinagar 3. Tele-health care & Distant Education in Medicine 4.Tele- follow-up clinics in Rheumatology, Endocrine surgery, Nuclear medicine. 5. Tele-mentoring, Tele-education- developed modules for the same 6.Tele- continuing medical education programs for postgraduates 7.Professional career development of rural doctors in practice (in remote North- East areas) through video conferencing 8. Research and developmental activities with its technical partners; capacity development 9. Policy making with national and international collaboration 10.Organizational Activities 11. Telemedicine Awareness 12.Technical knowledge exchange 13.Training and structured courses in telemedicine 14.Tele-healthcare in extreme locations and disaster management (e.g. Kailash Mansarovar, Kumbh mela)	11, 12,14
All India Institute of Medical Sciences(AIIMS), New Delhi	• Jammu & Kashmir network, Haryana (Rohtak Medical College, In house telemedicine link with Rural Hospital Ballabhgarh) • SCB Medical College Cuttack, Orissa • Guwahati, Northeastern states network. • SRMC, Chennai • AIMS, Kochi • SGPGIMS,Lucknow • Linked with 54 centers in India and abroad • Pan-African e-network with 54 countries of African Union • SAARC Telemedicine project with 6 SAARC countries • Tele education, Tele-healthcare(tele-consultations and tele-follow up)	http://www.aiims.edu/aiims/telemedicine/telepage.htm
Post Graduate Institute of Medical Education & Research(PGIMER), Chandigarh	1. 10 nodes[12]. Connected to • AIIMS,Delhi and SGPGIMS, Lucknow since April 1999 • 3 medical institutes in Punjab from 2005 • Centers in Punjab, Himachal Pradesh, Uttaranchal 2. Member of Pan African e-network and SAARC project 3. Tele-education and tele-consultation activity	http://www.pgimer.gov.in/code/telecentre/html/intro.htm 14
Christian Medical College, Vellore	Tele healthcare, tele CMEs, distance education	12
Tata Memorial Hospital	Tele Oncology Tele medicine and Tele pathology activities Connected to 30 centers	http://tmc.gov.in/misc/aboutus.htm

FUTURE PROSPECTS

India has already emerged as one of the world leaders in IT and networking and also has huge skilled IT man-power. Technological advances such as mobile phone net-working, banking and e-governance are already attaining high levels of proficiency in our country. Being a country spread over a vast geographical area with predominant rural population, India can be an ideal setting for telemedicine[5, 9]. Interestingly, many of youngsters with MBBS and BDS degrees are exploring career options in e-Health and Tele-medicine [10]. Networking of all peripheral health centers in the country is a big technical challenge. Never the less it is an achievable project for India in view of already available low cost terrestrial telecommunication, country wide internet connectivity and indigenous satellite services. It is heartening to see that Government of India is committed to implement e-health and the steering committee of planning commission for the 12th plan (2012-17) strongly suggested that all district hospitals and primary health centers and sub-centers be connected with telemedicine, Skype or similar audiovisual media and to encourage M-health (health care through mobile phones) to reach the remote corners of the country[13]. India has started successful programs to extend the telemedicine services to neighboring African and SAARC countries [14]. There is no doubt that India is very close to catch up with the rest of the developed world in the practice of e-health for all.

Table 3: Institutions in Corporate sector

Agency/ Institute Involved	Telemedicine Activities/ Achievements	Website/ Reference
Apollo Hospitals Apollo Telemedicine Networking Foundation (ATNF)	1. Networked all its hospitals and use in-house software Installed a number of peripheral telemedicine nodes through franchise. ATNF >125 peripheral centers including 10 overseas. 1 mobile tele-general medicine 2. Telemedicine consultancy and software providers 3. Active participants in: providing software telemedicine consultancy in multiple disciplines standardization of activities training personnel in telemedicine 4. Major participant in Pan African e-Network Project 5. Training programs in Chennai in conjunction with Anna University 6. Pioneering efforts in m-health and home healthcare	8, 12 http://www.telemedicineindia.com/
Amrita Institute of Medical Sciences (AIMS), KOCHI	• 166 nodes Lakshadweep Islands, Port Blair on the Andaman Islands and Leh, Ladakh also connected • Emergency Medical Center at Pampa(Sabarimala) • 1 Mobile tele-hospital: Mobile tele general medicine, tele radiology, tele-ophthalmology, tele gastroenterology, tele cardiology, biochemical testing with semi autoanalyzer, light microscopy • Tele healthcare- multiple specialties. • Tele surgeries, tele mentoring, tele-CMEs, distance education • Village Resource Center project • Telemedicine solution provider • Pan African e-Network Project	12 http://www.aimshospital.org/hospital/cdh/telemedicine.html
Sri Ramachandra University, Chennai	1. In Partnership with ISRO • Connected to Andaman & Nicobar Islands • Connects with 165 telemedicine centers in India • Connects with 35 specialist centers to share CME programs and live surgeries • Village Resource Center project with MSSRF and ISRO 2. Provide training to WHO fellows on telemedicine 3. With PACS system, real-time Tele-radiology: connected about 25 private centers including some centers in West Bengal and Northeastern states 4. Mobile telemedicine	http://www.sriramachandra.edu.in/telemedicine.htm
Fortis Health care Network and Escorts Heart Institute	Tele-cardiology 12 satellite/ heart command centers	12
Narayana Hrudayalaya and The Asia Heart Foundation	• Tele-cardiology- Tele consultations, CME tele-education and hrudaya posts (25 post offices are connected with NH) • Network of 4-5 ICUs, 20 telemedicine canters • TT-ECG Network: 308 centers: India and abroad • Pan-African e-Network project • ISRO Network	http://www.narayanahospitals.com/services/telemedicine/introduction/ http://www.rtiics.org/telemedicine.htm
Sir Ganga Ram Hospital, New Delhi	Telemedicine centers in Haryana and Rajasthan Mobile tele-hospitals Supported by ISRO	8
Sankara Netralaya	Pioneering activities by Sankara Netrayalaya in mobile teleophthalmology since 2003: covers Karnataka, West Bengal, Tamil Nadu, Maharashtra	http://www.sankaranethralaya.org/a-step-towards-combating-blindness-in-rural-areas.html http://www.sankaranethralaya.org/mobileunits-teleophthalmology.html
Arvind Eye care	Supported by ISRO Mobile Teleophthalmology services also available	http://www.aravind.org/telemedicine/eyestalkhome.htm
World health Partners: Skyhealth rural Centers (The Global Health Group)	Telemedicine centers in rural Bihar, Uttar Pradesh General and reproductive health	http://worldhealthpartners.org/Data/UCSF%20GHG%20Social%20Franchising%20Compendium%202012.pdf

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