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How to Improve Role of Information and Communication Technology for Health Care in Maharashtra State

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ABSTRACT: The limited health care budget, chronic shortage of health care workers and lack of incentives to retain those in remote areas further unsatisfied national health care delivery system. Recently, the application of information communication technology (ICT) to health care delivery and the use of telemedicine have raised hopes. Information and Communication Technology (ICT) solutions (e.g. e-health, telemedicine, e-education)are often viewed as vehicles to bridge the digital divide between rural and urban healthcare centres and to resolve shortcomings in the rural health sector. This study focused on challenges , infrastructure, use of ICTs as e-health solutions in rural healthcare centres, Recommendations are made with regard to how ICTs can be used more effectively to improve health rural healthcare centres based on existing state of health care in Maharashtra state . The paper also reflects the overall health organization in Maharashtra state .To fulfill the telemedicine , E health service there is need to provide high speed broadband connectivity to rural hospitals.

KEYWORDS: Telemedicine; eHealth; developing countries; Mobile clinic; ICT

I. INTRODUCTION

Maharashtra is the third largest state in India both in area and population. The state is bounded by the Arabian Sea in the west, Gujarat in the north west, Madhya Pradesh in the north and the east, Andhra Pradesh in the south east and Karnataka and Goa in the south. The state of Maharashtra has an area of 307,713 sq. km. and a population of 96.88 million. There are 37 districts, 358 blocks and 43711 villages. The State has population density of 314 per sq. km. (as against the national average of 312). The decadal growth rate of the state is 22.73% (against 21.54% for the country) and the population of the state continues to grow at a much faster rate than the national rate.

The state of Maharashtra has well developed health infrastructure with three tier system provide service to rural community The State has been implementing various national and state level programmes and schemes to bring out a holistic development in the State.

Table 1 Current healthcare infrastructure in Maharashtra State [1]

Sr no	Health Institution Total	Total
1	Sub Centre	10,580
2	Mobile Medical Units	40
3	Primary Health Centers	1,811
4	Rural Hospitals	387
5	Sub District Hospitals. (100 Beds)	25
6	Sub District Hospitals. (50 Beds)	56
7	General Hospitals	4
8	Other Hospital	1
9	District Hospitals	23

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10	Super Specialty Hospital	2
11	Mental Health Institutes	4
12	Women Hospitals	11
13	TB Hospitals	4
14	Health & Family Welfare Training institution	7

A. Reasons In case of ICT for health

1 As an effect of the ageing of the population in general, the number of citizens with chronic diseases is increasing, especially among elderly people throughout the poor family . This is a great challenge for both the well-being of the citizens and the public health care systems. Health care solutions provided by information and communication technology (ICT), also known as eHealth, offer one solution to this problem. The tools and services which contribute to eHealth provide better and more efficient health care services for all

2 Ensuring top-quality health care for citizens through ICT solutions eHealth technologies empower patients to take more responsibility for their own health and quality of life, and they lead to better cost-efficiency in the health sector. The use of eHealth technologies allows a mutually beneficial collaboration and involvement of patients and medical professionals in the prevention and treatment of chronic diseases. Overall, ICT can be used to ensure the top-quality health care of citizens

3 Better acceptance of ICT in health care is central for ensuring future health care provision Although basic eHealth technology is widely available on the market, the absorption of new knowledge and acceptance to use ICT in health care is varying remarkably among citizens and medical professionals. The wider use of ICT in healthcare is a basic condition for the development, implementation and further generation of innovative health care technologies. Therefore social capacity, knowledge and acceptance to utilize eHealth technologies among citizens and medical professionals need to be strengthened throughout the region .

B. Objectives:

1 Better acceptance of ICT in health care Even if everyone were to have access to basic IC technology, such as mobile phones and personal computers, the use of ICT in health care is not self-evident.

2 The acceptance of eHealth is varying among both citizens and medical professionals. Without general acceptance of eHealth, the continued generation of innovative health care technologies is not possible. Thus the overall objective of the ICT for Health project is to persuade citizens with chronic diseases and medical professionals in the partner regions to more readily accept eHealth, and to have the capacity and knowledge to use eHealth technologies in prevention and treatment

3 Transnational exchange of experiences between the partner regions During the project period, the participating countries and regions will compare and transfer their national, regional and local strategies on improving the social capacity of citizens and medical professionals to utilise eHealth technologies for better prevention and treatment in the framework of an ageing population.

4 Increased awareness on eHealth among medical professionals and citizens A number of medical professionals and citizens with chronic diseases will be educated and trained to use eHealth technologies in the prevention and treatment of chronic diseases through an educational pilot programme that will take place in some of the participating regions.

5 Increased patient responsibility for their own health In pilot programme regions, citizens with chronic heart disease apply self-monitoring technologies for secondary prevention and treatment processes in collaboration with medical professionals. In addition to the self monitoring process, the citizens will test a web-based eLearning tool that provides lifelong learning material about the prevention and treatment of chronic diseases. The pilot programme focuses on chronic heart disease as an example which may also be applicable to other chronic diseases.

6 Improving the mobility of citizens with chronic diseases A number of citizens with chronic heart disease will participate in a pilot programme to test a multi-lingual electronic health record. The relevant data will be self-recorded by the citizens with chronic diseases. An electronic health record improves the mobility of citizens with chronic

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diseases by making it easier and safer to travel through neighbouring European countries on business or holiday.

C. **Methodology: How do we reach our objectives?**

Different countries and regions have different approaches to the such types of project and therefore a transnational dialogue is essential in sharing the experiences and learning from each other.

- The project should include uses of ICT solutions such as "online debate" to share experiences. comprehensive self-monitoring system for chronic heart failure patients ,
- educational content for better utilisation of eHealth by medical professionals and citizens , and a multi-lingual personal health portal enabling citizens with chronic diseases to electronically document their health data, thereby supporting their mobility abroad
- All developed standardized solutions will be transferred and offered to health care providers and the general public in Region through a network of distributors and multipliers. Dissemination and dialogue with citizens and medical professionals The paper analyses the impact of the ageing population on the health care systems, and identifies and shares strategies in increasing the capacity to utilize eHealth in the prevention and treatment of chronic diseases through ICT.

II. PROBLEM STATEMENT AND ICT HEALTH CARE

The hospitals to keep track on patient history is difficult because of big files ,paper reports and search the proper files for that patient is time consuming and also marinating all record manually takes lot of space **,** time . Due to delay in searching record may be the reason to delay in treatment for patient and also for R &D purpose the medical data searching is time consuming for researcher and also transportation of data from one place to another place is time consuming and also chance to lose the manual data . The hospitals from rural Maharashtra state not using ICT due to lack of infrastructure , internet connectivity brakes down , speed of intent is slow , electricity problem , trained technicians in case of ICT are not available in rural area. Modern medical instruments are costly and need to maintain regularly . Due to all these reason there is delay in health care system .**Fig 1** Describes the problem statement in case of handling data base manually

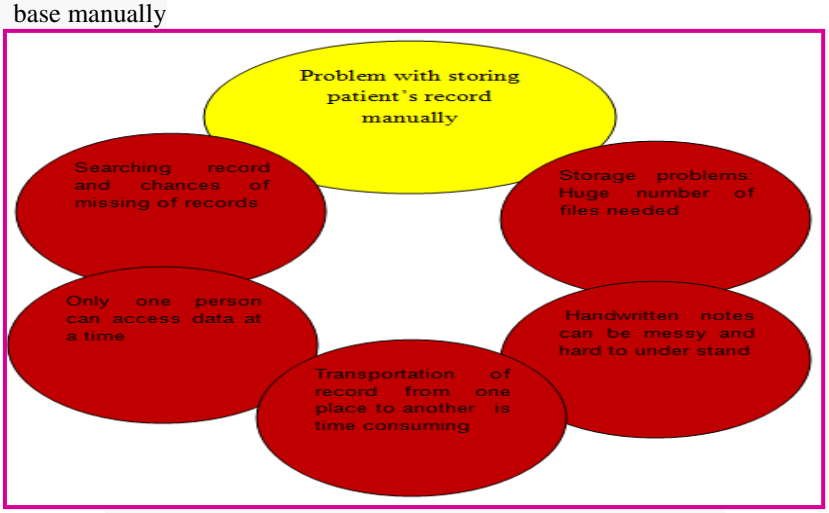

Fig 1 Critical to handle medical data base manually

A ICT in Healthcare: Scanning, life support, computer controlled equipment sensors (analogue and digital), data measured and its use

Innovative Medical Databases : To maintain the data base in hospitals for doctors and other staff , the following ICT techniques may involve in the service of hospitals

• electronic patient record keeping (EPR)
• blood bar coding and tracking systems ISBT 128
• use of the Internet, intranets and extranets
• distributed medical databases

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• backup and recovery procedures

Medical Databases (ERP)

- Patients records now stored electronically
- Data can be accessed by more than one medical professional at the same time
- No need to transport files (speed of data access)
- Security
- Latest information can be accessed from patient's bedside (example: results from blood tests)
- Sensors Used In Hospitals : Temperature , Blood Pressure ,Pulse, Blood Sugar , ECG (Heart Rate) , Respiratory Rate

Advantages :

1. No "Human Error" – no missed readings
2. More Accurate
3. Real Time Monitoring
4. Automatically Measure Trends

Scanning Devices and their advantages and disadvantages :

MRI

Use Radio Waves to build up a picture of the inside of a patient
Used for checking function of organs such as liver, kidney, spleen, blood vessels and heart damage

CAT

Similar x-ray, but multiple x-ray beams are sent out at different angles to produce a more detailed scan
Used to pinpoint tumours

Advantages

1. Can look at internal organs in 3D
2. MRI scans are safer than X-Rays
3. Higher cure rate due to early detection
4. Reduces the need for exploratory surgery

Disadvantages

1. scanning equipment very expensive
2. Exposure to radiation is dangerous for staff operating scanners
3. Patients have to be still for about 1 hour in an MRI machine
4. Faster Diagonosis

B. Challenges in case of Telemedicine [2][3]:

Perspective of medical practitioners: Doctors are not fully convinced and familiar with e- medicine.
Patients' fear and unfamiliarity: There is a lack of confidence in patients about the outcome of e- Medicine.
Financial unavailability: The technology and communication costs being too high, sometimes make Telemedicine financially unfeasible.
Lack of basic amenities: In India, nearly 40% of population lives below the poverty level. Basic amenities like transportation, electricity, telecommunication, safe drinking water, primary health services, etc. are missing. No technological advancement can change anything when a person has nothing to change.
Literacy rate and diversity in languages: Only 65.38% of India's population is literate with only 2% being well-versed in English.
Technical constraints: e-medicine supported by various types of software and hardware still needs to mature. For correct diagnosis and pacing of data, advanced biological sensors and more band width support is required .
Quality aspect: Quality is the essence. And everyone wants it but this can sometimes create problems. In case of healthcare, there is no proper governing body to form guidelines in this respect and motivate the organizations to follow it is left to organizations on how they take it.
Government Support: The government has limitations and so do private enterprises. Any technology in its primary stage needs care and support. Only the government has the resources and the power to help it survive and grow. There is not sufficient initiative taken by the government to develop it.

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III. THE GENERAL FRAMEWORK OF TELEMEDICINE PROJECT IN MAHARASHTRA STATE [13]

The overall network of Telemedicine in Maharashtra can be classified under two broad subheadings, viz.
1. Specialist End
2. Patient End

Specialist End: The Specialist end consists of Five Medical colleges. The medical colleges that have been developed as specialist end are KEM Hospital Mumbai, B. J. Medical College Pune, GMC Aurangabad, GMC Nagpur, Sir J. J. Hospital Mumbai. Nanavati Hospital at Mumbai has been made has honorary specialist centre. The J. J. Hospital at Mumbai has a dual role to play. It acts as main server centre for coordinating between the specialist centers and patient centers. Additionally, it also provides consultation service for the referred patient through teleconference

Patient End: The patient end constitutes of 27 districts hospitals of Maharashtra shown in **table** Furthermore 4 Sub district hospitals in each district acts as centers where patient from nearby areas come for consulting the doctors. All the district and sub district hospitals are equipped with modern state of art telecommunication network system for carrying out teleconference the sub District hospitals are further sub-divided into Regional Hospital (RH) and Primary Health Centre (PHC).

Technical Support: The first phase of telemedicine was technically supported by Indian Space Research Organization (ISRO) who provided their expertise in network connectivity. Initially there were serious troubles with internet connectivity as many times the connection would be
snapped. Later, this trouble was solved by using dedicated lease lines of fiber optic cables having a high bandwidth capacity. Thereafter a medical equipment supplier company "Progonosis" provided facilities for video conferencing along with other basic medical equipments such as those of scanner, BP apparatus etc

IV . FUTURE MODERN TECHNOLOGIES

1 Home Healthcare
Video conference using sensors so that consultation with doctor can be done from home

2 Diabetes management
Automatic blood glucose measurements are taken and if blood glucose is too low a sensor automatically releases glucose from a reservoir implanted into patient

3 Japanese Toilets
A Japanese company is developing a toilet that analyses urine and sends a report automatically to the GP if necessary

4 Telemedicine: 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 the continuing education of healthcare providers, all in the interests of advancing the health of individuals and their communities. To start the telemedicine for community who leaves at remote area for that purpose we require high speed broadband connectivity and WiMAX can provides high speed broadband connectivity .There is need to provide WiMAX infrastructure to connect all hospitals to provide telemedicine service for community to improve the health of rural Maharashtra state . **Fig 2** shows the telemedicine components

5 Health care model based on WiMAX technology : . WiMAX would operate similar to WiFi but at higher speeds, over greater distances and for a greater number of users. WiMAX could potentially erase the suburban and rural blackout areas that currently have no broadband Internet access because phone and cable companies have not yet run the necessary wires to those remote locations. Health care model based WiMAX technology is shown in **Fig 3**

The health care system based on WiMAX Broadband connectivity The model is having multiple telemedicine hospitals, mobile medical specialists and rural mobile units/clinics forming a large virtual enterprise. It support mobility at both the patient's end and the specialist's end. Support for mobility at the patient's end will result in

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increased penetration. In addition, since small mobile devices can be used for this purpose, it is cost effective. Due to these factors, the scale of operation of the system increases. Mobility at the end of a specialist also has several key advantages. Which are given below

1. Specialist need not always be at the central server waiting for reports to be received.
2. Improved availability - a report will be delivered on to the handheld of a specialist, who may be located, anywhere, rather than a central server, so that he or she can immediately attend to it.

Telemedicine applications [5] include high resolution video and data streaming from medical equipment, for the clinical user communities. This is one of the areas where WiMAX may offer at reasonable costs the necessary bandwidth in mobility conditions for applications like: Tele diagnosis (remote diagnosis), Emergencies (remote diagnosis in an emergency situation, i.e.real time response needed), Remote second opinion (a specialist opinion is needed but the specialist is available only in remote area) and Patient followed by a specialist visit in an authorized remote medical centre where results and images are collected and forwarded to the principal centre).

Table 2 The districts in Maharashtra state used telemedicine service[12]

Thane	Bombay
Alibagh	Nashik
Pune	Satara
Ratnagiri	Osmanabad
Latur	Bid
Ahmednagar	Parbhani
Jaina	Aurangabad
Jalgaon	Buldana
Amravati	Wardha
Nagpur	Chandrapur
Garhchiorli	Bhandara
Gondia	Nandurbar
Hingoli	Washim
Sindhudurg	

Table 3 Medical services usage through telemedicine in Maharashtra state [12]

S.No.	Specialty	Patients Referred from District (April 2010 to March 2011)	Opinion Received from Specialty Centers (April 2010 to March 2011)
1	Medicine	1059	1032
2	Surgery	344	316
3	OBGY	146	207
4	Pediatrics	393	387
5	Cardiology	65	51
6	Neurology	45	44
7	Anesthesia	28	29
8	Chest	25	23
9	Ophthalmology	24	24
10	Skin VD	85	83
11	ENT	76	43
12	Orthopedics	278	287
13	Psychiatry	40	40
14	Radiology	1301	1400
15	Ayurvedic	68	30
16	Unani	155	160
17	Forensic	38	36

Table 4 WiMAX application and bandwidth [3]

Application	Bandwidth	Latency	Jitter
Interactive gaming	Low bandwidth, 50 kbps	Low latency, 80 ms	N/A
Voice telephony, VoIP, video conf	Low bandwidth, 32-64 kbps	Low latency, 160 ms	Low jitter <50 ms
Streaming media	Moderate to high bandwidth, <2 Mbps	N/A	Low jitter <100 ms
Instant messaging Web browsing	Moderate bandwidth 2 Mbps	N/A	N/A
Media content download	High bandwidth, 10 Mbps	N/A	N/A

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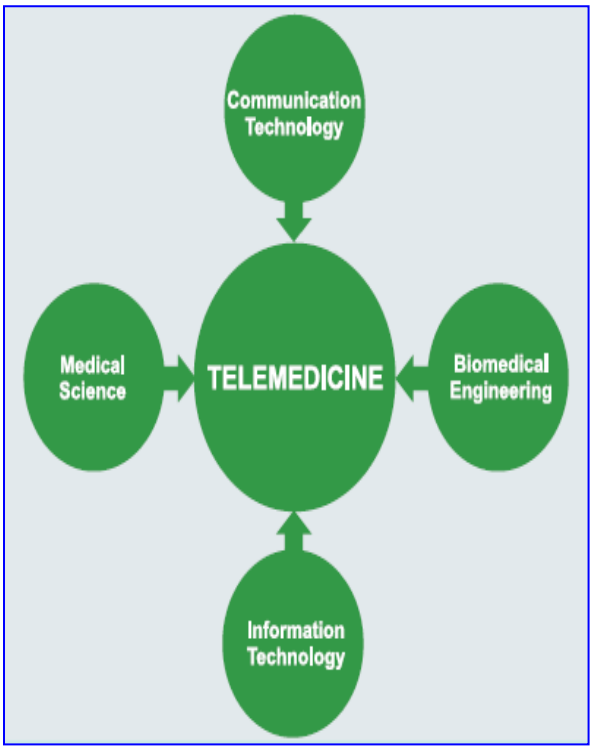

Fig 2 Telemedicine components [4]

V. WIMAX NETWORK WORKING SCENARIO [7] [10]

Working scenario is shown in **Fig 4.** WiMAX system consists of two parts

1. **WiMAX base station**: As name explains base station is place where WiMax signals are broadcasted. It consists of electronic devices and WiMax Tower. This tower works exactly like GSM network phones towers standing high upin the air to broadcast radio signals. WiMAX tower base station can cover up10Km radius. In theory it suggests to cover a lot more distance than just 10Km, it can reach some where about 50 km (30 miles), but in fact due to certain geographical limitations it goes as far as 10 km approx. 6 mils. Anywireless connecting device for WiMAX will connect to WiMAX network if fallen in to the range.

2. WiMAX Receiver: It is device or devices which receives the signals from WiMAX base station and connects to the WiMAX networks. These devices are usually stand alone Antenna or PCMCIA slot card for laptops or computers. Connecting to WiMAX base stations works as similar as connection of Wifi to access point works, the only difference is that WiMAX covers much wider area.

A The WiMAX provide LOS and NLOS services [8][9]:

1. There is the **non-line-of-sight**, WiFi sort of service, where a small antenna on your computer connects to the tower. In this mode, WiMAX uses a **lower frequency range** 2 GHz to 11 GHz (similar to WiFi). Lower-wavelength transmissions are not as easily disrupted by physical obstructions they are better able to diffract, or bend, around obstacles.

2. There is **line-of-sight** service, where a fixed dish antenna points straight at the WiMAX tower from a rooftop or pole. The line-of-sight connection is stronger and more stable, so it's able to send a lot of data with fewer errors. Line-of sight transmissions use **higher frequencies**, with ranges reaching a possible 66 GHz. At higher frequencies, there is less interference and lots more bandwidth.

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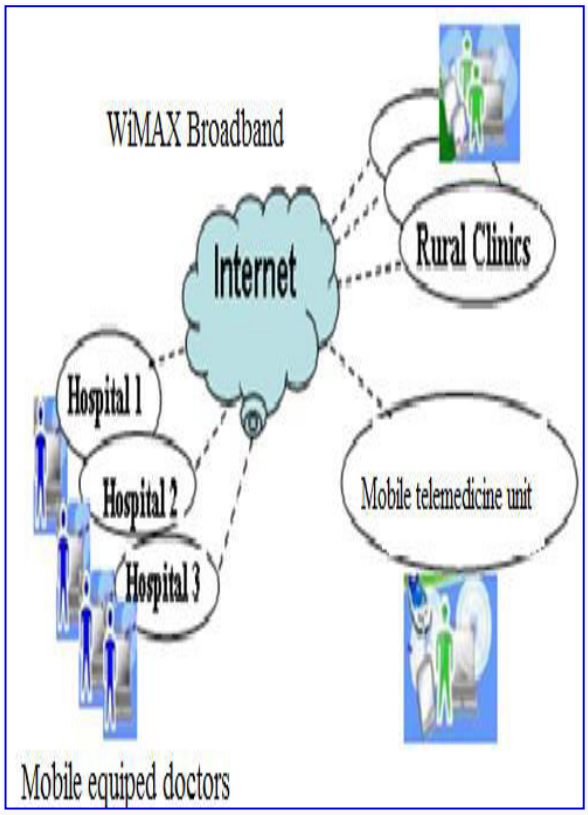

Fig 3 Health care model based on WiMAX technology

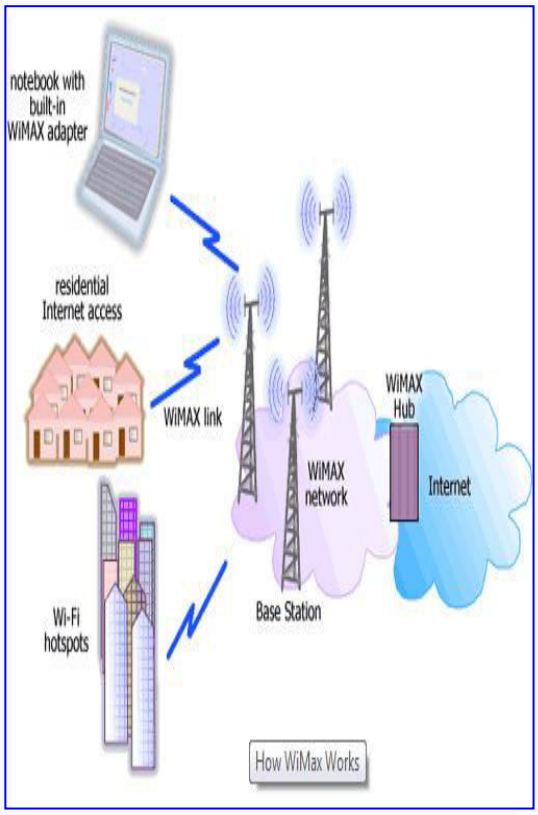

Fig 4 WiMAX Networking Scenario[10]

B Technologies used in Hospitals[6] :

1 Wi-Fi is a wireless networking technology with network size ranging from size of a room to area covered by a building. This technology can be used in the hospitals to provide broadband internet connectivity to doctors within the hospital.

2 WiMAX is a wireless digital communication system with range of 50km. This technology can be used to provide the "last mile" connectivity viz. providing broadband internet connectivity to the rural areas where installing GPRS is expensive

3 ZigBee is a wireless mesh networking standard which is intended to be simpler and cheaper than other Wireless Personal Area Networks (WPAN) technologies like Bluetooth. It also consumes less-power. Thus the target applications are those that require low data rates, long battery life, and secure networking. Bluetooth is a standard similar to ZigBee with the advantage that more devices support it. Thus, ZigBee / Bluetooth are well suited to be integrated into the medical sensors.

4 Use of NFC enabled mobile phones by health worker

An economic model needs to be worked out for the sustenance of the telemedicine system. As a research prototype implementation, this part has not been explored. Integrating health insurance into the telemedicine system would make patient authentication and data security very important. As a pilot implementation, smart cards could be issued to the rural patients. The smart card would store the private key for the patient. NFC enabled mobile phones used by the health worker can read the data from the smart card and authenticate the patient to the system. Once the prototype is found to be feasible, biometric smart cards could be used for better security

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VI. ADVANTAGES AND DISADVANTAGES OF ICT IN HEALTHCARE[11]

Type of technology	Range of uses	Skills/technology needed	Advantages	Disadvantage
Telephone				
Landline and mobile phone	Person to person Centralized decision system, such as NHS Direct Direct contact for appointments Basic information Telephone counseling	Good telephone manner Reading conversations without visual clues Clear, concise approach	Universal access Quick and easy In some counseling situations, patients may prefer not to see the nurse Confidential Can be recorded for training purposes	Others may have use of a patient's landline Or mobile phone, compromising confidentiality No written account of conversation
SMS text messaging	Person to person Centralized decision system, such as NHS Direct Basic information Appointments Blood results Brief support message	Mobile phone technology Text language	Quick and easy Patients can access at any time Patients can refer back to the message Record of conversation can be stored	Some patients may not be able to access and/or use SMS Not a formal core mode of communication in healthcare settings
Specialist diagnostic monitoring equipment				
	Monitoring and evaluation of patients' condition Information to aid clinical decision making	Access to Equipment Skills in using technologies	Patients can take readings in their own time Since they are engaged, patients tend to have better understanding of the reasons for taking readings Can be used by technical experts such as paramedics to access remote assistance	During an acute episode patients may not be able to take their own readings Potential for professionals to become over-reliant on technology and forget to interact directly with patients

Type of technology	Range of uses	Skills/technology needed	Advantages	Disadvantage
Internet technologies				
Email	Person to person Information alerts Basic information Appointments Blood results Support messages Links to advice pages	Keyboard skills Use of email Text based communication	Quick and easy Patients can access at any time Patients can refer back to the message Record can be stored Can be asynchronous	Many patients do not have access or skills to use email
Web pages	Information Announcements	Advanced skills in information	Easily accessible Can be found via a	A lot of information is

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	Information source Can provide substantive background information Can be interactive Can be used for self assessment	management Clarity about the purpose and scope of this source of information	search engine	available – the source needs to be credible Information needs to be clear – needs visual clues as well as text Navigation between pages needs to be clear Employer may not have a web output policy Needs technical support
Internet chat rooms	Support from peer group to other patients with long term conditions	Skills in locating and/or designing purposeful online discussion groups Skills in facilitating online discussion	Support from peers contributes to acceptance of long term conditions Easy to access for many young people	Comments can be misinterpreted and if not monitored or moderated misinformation can be generated Usually peer led with limited professional input
Webcam	Visual and audio interface	Access to equipment Skills in using visual and sound technologies	Patents appreciate opportunity for remote consultation	Some patients may not be able to access and/or use webcam Not a formal core mode of communication In healthcare settings Some people may feel uncomfortable with their image being on screen

VII. CONCLUSION

The study shows that the success or the failure of a telemedicine story does not only rely on technological factors, but on e-governance, an enabling policy environment, multi sectored involvement of stakeholders and effective human resource management and capacity building. There is no single perfect technology in eHealth projects using combined technology adjusting to the local context is encouraged. Since telemedicine is still in a relatively premature phase in in India .It is difficult to talk about objectively measurable impact at present, even though the technology has already demonstrated practical applicability in a number of settings. Further research is needed on how to scale up beyond proof of concept, evaluation of impact, how telemedicine or eHealth can address the voice of those affected by poor health and the marginalized, taking into account the local language, and content development to use telemedicine at the grass roots level. To improve the health care system in Maharashtra state there is need to provide WiMAX broadband connectivity to root level then only the telemedicine can be possible

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REFERENCES

[1] Sanjay Kamlakar, Under Secretary, PHD, Maharashtra Nilesh Gauda, Sr. Consultant,KPMG Nitin Anand, Consultant, KPMG Monika Malik, Consultant, KPMG Public health depart,ent Maharashtra – bringing value based e governance in practice https://it.maharashtra.gov.in/PDF/eGovernance%20in%20Public%20Health%20Dept.pdf
[2] Aparajita Dasgupta, Soumya DebTelemedicine:" A New Horizon in Public Health in India"
[3] kalpana chaudhari , SVNIT , Surat M.Tech thesis on "Studies on Application of Electronic Governance Using Information and communication technologies for rural development "
[4] www.isro.org/publications/pdf/Telemedicine.pdf **E**nabling specialty healthcare to the rural and remote population of India
[5] Silvano Mignanti, Gabriele Tamea , Ilaria Marchetti **"**WEIRD Testbeds with Fixed and Mobile WiMAX Technology for User Applications, Telemedicine and Monitoring of Impervious Areas " 4th International Conference on Testbeds and Research Infrastructures for the Development of Networks & Communities. TridentCom 2008. March 18–20, 2008, Innsbruck, Austria
[6] Sriram Kailasam, Santosh Kumar, and D. Janakiram" Mobile Telemedicine using Data Grid " http://publications.cse.iitm.ac.in/40/1/MobileTelemedicineUsingDataGrid.pdf
[7] How WiMAX work , www.wifinotes.com/wimax/how-wimax-works.html
[8] WiMAX connection http://www2.proxim.com/ptpwireless-backhaul.html
[9] WiMAx coverage and speed http://www.tutorialspoint.com/wimax/wimax_building_blocks.htm
[10] How WiMAX work http://computer.howstuffworks.com/wimax.htm
[11]http://www.nursingtimes.net/Journals/1/Files/2009/10/26/Table%201%20-%20Advantages%20and%20disadvantages%20of%20ICT%20in%20healthcare.pdf
[12] Randhir Kumar, Dr. P K Choudhary, S M F Pasha Article on "Telemedicine in the State of Maharashtra: A Case Study" pg24-26 , CSI Communications, May 2012 , www.csi-india.org

BIOGRAPHY

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