A Survey on the Uses and Future Prospects of Telemedicine in the Healthcare Industry in the North-Eastern Region of India with Special Reference to Assam

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Abstract: **Telemedicine is the delivery of health care and the exchange of health-care information across distances. The prefix 'tele' derives from the Greek for 'at a distance' hence, more simply, telemedicine is medicine at a distance. As such, it encompasses the whole range of medical activities including diagnosis, treatment and prevention of disease, continuing education of health-care providers and consumers, and research and evaluation. Telemedicine is a health-care delivery concept that enables distant patients especially in rural areas to be examined by the physicians using telecommunications technologies.**

Telemedicine has gained tremendous popularity in developing countries where rural population is deprived access to even basic healthcare. The state wise breakup of the nos. of telemedicine centre is: Arunachal Pradesh-8, Assam-23, Manipur-9, Mizoram-7, Meghalaya-9, Nagaland-8, Sikkim-4 and Tripura-4. The major objectives of the project is to connect the district level hospitals to the specialty/super specialty hospitals of the region as well as outside the region for better healthcare at minimum cost using modern technology.

Keywords: **Diagnosis, Disease, Healthcare, Prevention, Rural Population, Technology, Telecommunication, Telemedicine.**

1. Introduction

One of the great challenges facing humankind in the 21st century is to make high-quality health care available to all. Such a vision has been expressed by the world health organization (WHO) in its health-for-all strategy in the 21st century. Realizing this vision will be difficult, perhaps impossible, because of the burdens imposed on a growing world population by old and new diseases, rising expectations for health, and socioeconomic conditions that have, if anything, increased disparities in health status between and within countries.

Traditionally, part of the difficulty in achieving access to health care has been that the provider and the recipient must be present in the same place and at the same time. Recent advances in information and communication technologies, however, have created unprecedented opportunities for overcoming this by increasing the number of ways that health care can be delivered. This applies both to developing countries with weak or unstable economies and to industrialized countries. The possibilities for using information and communication technologies to improve health-care delivery are increasingly being recognized. The WHO has stated that with regard to its health-for-all strategy it recommends that the WHO and its member states to improve health-care delivery, by utilizing information and telecommunications technologies, is also being considered by those with the financial means to do so.

Telemedicine is the delivery of health care and the exchange of health-care information across distances. The prefix 'tele' derives from the Greek for 'at a distance' hence, more simply, telemedicine is medicine at a distance. As such, it encompasses the whole range of medical activities including diagnosis, treatment and prevention of disease, continuing education of health-care providers and consumers, and research and evaluation. Telemedicine is a health-care delivery concept that enables distant patients especially in rural areas to be examined by the physicians using telecommunications technologies. It is given that majority of population dwells in rural areas in developing countries that represent the largest patient base of variety of health issues. Access to basic healthcare, doctors, and treatment is hardly reachable. Telemedicine has gained tremendous popularity in developing countries where rural population is deprived access to even basic healthcare. Presently telemedicine is proving extremely viable and feasible solution reaching out to rural population and bridging disparity in quality and access to healthcare between urban and rural regions. The telemedicine market has witnessed spectacular growth lately mainly because of convergence information technology communication and healthcare. This study examines the current state of telemedicine in developing countries.

2. Telemedicine – Meaning and importance

Like any other new modern service telemedicine has been a step forward towards a better overall medical service. Noticing the rapid spread of telemedicine, the benefits have definitely contributed. Telemedicine shortens the distances and saves time through bringing healthcare services in reach of patients. Not

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only do patients benefit from telemedicine services, physicians and health providers can reach patients and colleagues in distant areas with no time. Furthermore, telemedicine reduces the cost and inconvenience of traveling. The hospital's length of stay for patients is reduced and chronic disease managements are improved due to the use of telemedicine. Telemedicine provides care up to the level of conventional healthcare, even better in some specialties like mental health and ICU care.5, 8 In light of all telemedicine benefits for both patients and healthcare providers, the demand for telemedicine is increasing. Studies conducted in the past fifteen years prove the spread of telemedicine combined with increased patient satisfaction.

3. Telemedicine in north eastern region of India

In North eastern region a project known as ISRO-NEC telemedicine project has been formulated in July 2004 using satellite communication through Very Small Aperture Terminal (VSAT) to commission 72 telemedicine nodes in all the districts of Assam and all the north eastern states including Sikkim. The state wise breakup of the nos. of telemedicine centre is: Arunachal Pradesh-8, Assam-23, Manipur-9, Mizoram-7, Meghalaya-9, Nagaland-8, Sikkim-4 and Tripura-4. The major objectives of the project is to connect the district level hospitals to the specialty/super specialty hospitals of the region as well as outside the region for better healthcare at minimum cost using modern technology. The major stakeholders of the project are ISRO, North Eastern Council (NEC) and state governments of the region. NESAC is coordinating the project from ISRO side in installation & commissioning of the system, training, monitoring, trouble-shooting etc. Till date a total of 25 telemedicine centers has been commissioned and remaining 47 are in pipeline. Another telemedicine project known as Army Telemedicine Network for NER is also operational in the north eastern states in collaboration with Indian Army form March 2008. Under this network a total of 6 telemedicine centre (Table 2) has been commissioned in various army hospitals in the region. Telemedicine today is one of the most vital SATCOM application programmers of ISRO in the country. The Telemedicine Programme is an innovative process of synergizing benefits of Satellite communication and information technology with Biomedical Engineering and Medical Sciences to deliver the health care services to the remote, distant and underserved regions of the country. ISRO has made a modest beginning in telemedicine using satellite communication in the form of a telemedicine pilot project in the year of 2001, connecting Apollo Hospital at Chennai with the Apollo rural hospital at Arogonda village in the Chittor district of Andhra Pradesh. Now a number of telemedicine networks are operational all over the country.

NESAC is also coordinating establishment of ISRO Telemedicine Network in the North Eastern Region. Govt Cancer Hospital in Agartala, Tripura has been provided telemedicine connectivity under the ISRO CancerNet Project. The modalities of providing operational services in the telemedicine centres under the ISRO NEC Project are being worked out in consultation with North Eastern Council. Regional Workshop on Telemedicine was organized successfully on 03rd December 2009 at Shillong. A total of 75 delegates participated in the workshop including very senior/renowned doctors of the region along with policy makers of various levels. The workshop was inaugurated by Mr. W M S Pariat, Chief Secretary of Meghalaya and Dr. B. N. Suresh, Director, VSSC was the guest of Honor of the program.

Inspection was done for site readiness at 8 civil hospitals for telemedicine system installation. The sites are found ready and equipments have been dispatched to Civil Hospital, Hailakandi, Assam and NEIGRIHMS, Shillong, Meghalaya. Installation will start soon. All the old hardware has been replaced with new one at selected Telemedicine Centres in North Eastern States. The new systems are working fine.

4. Future prospects of telemedicine in Assam

Government of India and other organizations have been planning gradually implementing various telemedicine projects to provide better healthcare services to people throughout the country. A healthcare initiative called Social Endeavour for Health and Telemedicine (SEHAT) has been launched in 2015 by Government of India based on the vision of 'Digital India'. SEHAT focuses on usage of digital technologies to allow people living in rural areas to easily and efficiently access knowledge, skills, information and other 6 services in various sectors.

To extend healthcare facilities to the remotest and rural areas of country through telemedicine networks, ISRO has decided to collaborate with Union Ministry of AYUSH (Ayurveda, Yoga & Naturopathy, Unani, Siddha & Homoeopathy) to launch a project called "Tele-AYUSH" (Pharmabiz, 2016). Telemedicine and health care practices are expected to grow in India due to prioritization by the Government in telecommunication and health sectors. With the development of state-of-art technologies and infrastructure in India, telemedicine projects have been able to extend healthcare services even to remote areas. Telemedicine market has also emerged as a fast growing healthcare sector in India.

According to a study conducted by the Associated Chambers of Commerce & Industry of India (2016), telemedicine market in India is expected to be around $32 million by 2020. Establishment of legal framework, availability of trained human resources, development of national e-health policies, availability of regular and adequate funds are some of the factors that will determine growth of sustainable telemedicine network in India.

Piramal Swasthya, (formally known as 'Health Management and Research Institute'-HMRI) the non-profit organization supported by the Piramal Foundation today announced that they have crossed the 5 million beneficiary benchmark in Assam, reaching out with healthcare solutions to the underprivileged within the region in a time frame of three and half years. This

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accomplishment comes within 40 months of starting the operations and is a milestone in the primary healthcare sector in India.

Piramal Swasthya is a not-for-profit organization working to make healthcare accessible, affordable and available to all segments of population, especially the most vulnerable. It was launched in Assam in November, 2010, where they worked in association with the National Rural Health Mission (NRHM) of Assam to set up a call centre for pregnant women. Through this initiative, their efforts were focused on reducing the Maternity Mortality Rate (MMR) and Infant Mortality Rate (IMR).

Initially, only the 104 - Health Information Helpline (Sarathi 104 Call Centre) was launched and subsequently more projects were added to the Piramal Swasthya service lines - such as the Village Health Outreach Program (Sanjeevani Services), Mother and Child Tracking System (MCTS) Outgoing call center, Mobile Medical Units (MMUs), World Diabetes Foundation (Denmark) initiative and an upcoming Telemedicine Project (NRHM). Piramal Swasthya has been awarded the tender to run Telemedicine operation in three districts of Assam namely in the Civil Hospital of Chirang, Lakhimpur and GMCH, Guwahati. NRHM, Assam has decided to implement the National Rural Tele-Medicine Network during the Financial Year 2012-13.

The initiative was envisioned mainly to address the critical shortage of human resources for health and clinical services in the state. For thousands of patients in Lower Assam, who do not have the facilities to avail the best medical care, the opening of a telemedicine centre in Bongaigaon has come as welcome news. The telemedicine centre was inaugurated at Bongaigaon Refinery and Petrochemicals Ltd (BRPL) Hospital, Dhaligaon on April 2015. A.K. Sarmah, managing director of BRPL, inaugurated the centre by holding a video-conference with neurosurgeon Prof. K. Ganapathy, who is also vice-president of Apollo Hospital and head of Apollo Telemedicine Networking Foundation.

The Bongaigaon Refinery and Petrochemicals Ltd had teamed up with Apollo Telemedicine Networking Foundation to launch the centre. Apollo Hospitals is a leading figure in the hospital business. Telemedicine, through its integrated audio-visual facility, enables doctors in remote places to consult specialists and super-specialists in premier hospitals outside the region and abroad for better diagnosis and treatment of patients. This also reduces the burden on patients and their families by removing the need to travel to major cities for treatment.

Telemedicine also helps in professional enrichment of doctors by allowing them to take part in various training and learning programmes through the system. Lower Assam, mainly comprising districts of Nalbari, Barpeta, Bongaigaon, does not have many good hospitals and the patients here are forced to travel all the way down to the state capital for advanced treatment.

5. Literature review

Wootton (2005) described that the evidence of the value of telemedicine is wide-ranging. Telemedicine has been shown to improve time-to diagnosis, facilitate care access for patients in remote regions, and increase patient satisfaction. Health care organizations, networks and government organizations faced with provider shortages, access disparities and budget challenges, are adopting telemedicine to effectively connect geographically-remote patients with specialists based in centers of excellence, to allow scarce specialists to be on call across networks, and to provide remote monitoring of patients (Hospital Mortality, Length of Stay, and Preventable Compilation Among Critically Ill Patients Before and After Tele-ICE Reengineering of Critical Care Processes, 2011).

Bagchi (2006) mentions that a number of recent studies support the view that telemedicine-based interventions can result incomparable outcomes to traditional, in-person meetings, while at the same time offering the potential for cost savings and other efficiencies. The U.S. Agency for Health Care Quality and Research published findings from a study in the New England Journal of Medicine that support the use of video conferencing technology in the treatment of patients with hepatitis C virus infections. (Outcomes of Treatment for Hepatitis C Virus Infection by Primary Healthcare Provider, 2011).

Craig (2005) found that for several hundred hepatitis C patients in New Mexico, the rate of serious adverse events was significantly reduced and cure rates were comparable for patients treated by local primary care providers and patients seen at the geographically distant University of New Mexico hepatitis C clinic. The authors concluded that local providers, properly supported via telemedicine by specialists, tended to be more culturally competent with regard to their specific community.

Therefore, by allowing the patients to stay close to home instead of traveling for care, patients' adherence to treatment tended to improve and they were generally in more frequent contact with their providers (Evaluation of the Effect of Consultant Characteristics of Telemedicine Diagnosis and Treatment, 2011). Tele-Health is a tool for access. Can be asynchronous (store and forward) or synchronous (interactive). Technology needed includes: patient exam camera, digital electronic stethoscope, fiber-optic horoscope, fiber-optic ophthalmoscope, digital camera, document camera, intra-oral camera, laser caries detector, clinical video (Polycom, Vcom), and clinical exam rooms. In regards to transmission spectrum, you need to have good quality (ISDN and LAN) while maintaining secure lines. Maritime Medical Genetics Service (MMGS) serves about 2 million people. Reimbursement can be an issue: some third party payers reimburse, Medicare pays universal (although only from certain sites), and Medicaid does not reimburse. State licensure is an additional issue, although it was suggested that the consultation exception could be used. Future directions of telemedicine include more investigation of

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reimbursement, transmission costs, and financial state of federal and state budgets, interoperability, new compression algorithms, asynchronous patient driven consultations, and internet medicine.

WHO (2016) reports on the Maritime Medical Genetics Service based in Halifax, Nova Scotia, which delivers care to ~2 million people (only regional genetic services). The furthest point is 7.5 hours away by car. The program was developed out of necessity, as some patients were not willing to travel that far. Phone discussions were started but not felt to provide optimal services. At the time of the article, there were 8 locations with tele-health links to the IWK Health Centre where MMGS is located. The MMGS carried out pilot project with cancer genetics. Satisfaction with services was good, and therefore they moved on to other types of genetic cases where a physical exam was not required (includes prenatal genetic counseling and follow-up of metabolic disorders). They also allowed the option of having a second visit and result session for HD predictive testing counseling via videoconference (the first session was required to be face-to-face). Health care providers did not feel as much of a connection with patients, but the patients reported high levels of satisfaction.

WHO (2019) mentions about a special protocol which was developed for individuals with hereditary hemochromatosis, since most patients were treated at time of referral and genetic counseling was not considered urgent. To provide education, a group session was held with a hematologist, hepatologist, geneticist and genetic counselor. 70 people attended in person, 27 went to a telehealth site and participated via videoconference. MMGS has not done telemedicine for consultations where a physical exam would be required due to cost of high resolution cameras and special training to the support staff. They may reconsider since more clinics are obtaining high resolution cameras. Telemedicine in Maine and Florida has been used for diagnosis of genetic disorders, although it was noted that training of onsite care provider and patient willingness to cooperate influenced the quality of the exam. Overall, the MMGS reports good experiences with Telegenetics, although equipment malfunctions periodically occurred. Even in Canada, licensure and liability across province lines and reimbursement issues can be a limitation.

6. Overview of telemedicine system in real time applications

Khandpur (2017) reported on the experiences of telemedicine in Vermont. The program was divided by phases. In Phase 1, they reported failed and dropped connections and lack of confidence by the doctors in the new technology. In Phase 2, they used ISDN lines with daily testing, multiple cameras, and new ceiling-mounted telemedicine units. The top 10 specialties using telemedicine included: mental health, cardiology, pediatrics, dermatology, neurology, orthopedics, radiology (military bases), home care, endocrinology, surgery (wound care). Pediatric applications included: cardiology,

diabetes, asthma, ophthalmology, ENT, school-based, orthopedics, trauma & critical care. The Vermont telemedicine project also has contracts with prisons. It was noted that Store & Forward medical care was not reimbursable.

Misra (2005) gives an overview of existing laws regarding telemedicine by state. Endorsements are the most common method used to allow an individual licensed in another state to practice in their state, although it can be a lengthy and complicated process. The Federation of State Medical Boards (FSMB) developed an act for abbreviated licensure process for Engineering and Technology Publishing 164 doctors providing telemedicine to their state. 8 states have approved similar acts. The National Council of State Boards of Nursing (NCSBN) developed a mutual recognition model, and 20 states are using the interstate compact. Description of the Northern Main Tele-health Network (NMTN), used for clinical, educational, and administrative purposes, includes satisfaction surveys and cost analysis. An English study of comparing telemedicine to face-to-face encounters with cancer genetic counseling, 16 telemedicine and 21 face-to-face encounters showed a similar increase in knowledge, decrease in anxiety, and satisfaction levels.

Report on a pilot study of tele-genetics in Wales for cancer genetics in 1998 with small sample size. Study involves only eight patients, although they rate high satisfaction with telemedicine genetic services (higher than satisfaction of genetic nurses providing onsite support, who did not feel needed). Establishing rapport was a concern of the genetic consultants elevates. Typical and prototytype telemedicine system Report on telemedicine with the Queensland Clinical Genetics Service in Australia, the only genetics service provider in the state (~3.5 million people). For the initial study, they only offered teleconferencing when physical exam was not required, mostly for cancer genetics.

Sood (2007) says that telemedicine and face-to-face groups were both seen in Brisbane to remove advantage of travel time and cost. A document camera was also used in the telemedicine visits. People involved with 24 encounters were surveyed (16 tele-genetics and 8 face-to-face), demonstrating a positive response from doctors, genetic counselors, and patients. Limitations included: videoconferencing was more difficult when multiple family members present and funding was problematic. Review and classification of 66 "scientifically credible" studies on telemedicine that included comparison with alternative model of care, each study is listed and classified in the appendix concludes that there are not many good-quality studies on the analysis of the benefits of telemedicine.

American Telemedicine Association (ATA, 2019) describes about early telemedicine project called the Georgia Statewide Telemedicine Program (GSTP) between the Medical College of Georgia and the Telemedicine Center with the Ware County Health Department. Study reports on 333 consults from 1995-1997, 16% were genetics. Of the response from the doctors, most thought it could be successful, 44% thought cost-effective,

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48% thought time effective, 33% thought patients would find acceptable, and generally opinions of telemedicine improved over a year. Families were overall satisfied. It was noted that telemedicine was more likely to be successful when part of integrated health services delivery (not sole mode of patient care).

The study reported on a 3-year pilot Telegenetics project in rural Maine. They used ITV technology with existing ISDN phone lines. 4 barriers were identified: lack of knowledge of telemedicine services, lack of understanding of the role of genetic services, location of ITV unit, hospital credentialing and privileging processes for physicians. Many presentations to given to physicians to educate about telemedicine services. The study included 24 rural sites and 125 patients. Most patients were pediatric (64%). Patient satisfaction was good (3.56 on 4.0 scale), although there was only a 25% response rate. Commentary on Marcin et al. article that lists several obstacles to telemedicine, including difficulties in having equipment and coordinator, willing specialists, knowledgeable local physicians; reimbursement issues; and medical liability. This needs assessment identified barriers in access to subspecialty care traveling, missing work, and obtaining medications. The study looked at 130 telemedicine consultations for 55 CSHCN in rural areas. Specialties included Endocrinology, Psychiatry, Gastroenterology, Hematology, Oncology, Nephrology, and infectious disease. Overall satisfaction was rated very high, although 2 of 22 did not feel that the telemedicine gave an adequate examination.

The need for innovative approaches to the provision of services arises from the increasing awareness of the need for genetics services in many aspects of health care, continued shortage of genetics professionals, and economics of the provision of genetics services dictating their primary location in tertiary care centers." The editorial notes that telemedicine does change delivery of care and calls for prospective studies of Telegenetics consultations and face-to-face consultations looking at accuracy of diagnosis, diagnostic impact, and patient outcomes. Authors write that the challenges lie in "extensively evaluating Telegenetics technologies, properly adopting them, and making informed decisions about their appropriate use". The report examines current key issues with telemedicine including payment issues, legal issues, privacy issues, infrastructure, evaluation, and emerging trends. Lack of reimbursement remains a large obstacle. Several organizations (such as the American Psychological Association and American Dermatology Association) have created specific telemedicine standards and guidelines for their fields of specialty. OAT is working with groups to expand clinical guidelines and promote safety and security. The Joint Working Group on Telemedicine (JWGT) is trying to work with states to assess feasibility of creating common licensure application forms.

7. Research objectives

The present study is undertaken by keeping in mind about the benefits of using telemedicine in the healthcare industry. The objectives will help in understanding about the topic of telemedicine. It will also depict about the benefits of using telemedicine in the healthcare industry. Moreover, the objectives taken to carry out the thesis will help in identifying about the future prospects and uses of telemedicine in the Assam region. The objectives are as follows:

1) To identify the benefits of using telemedicine in the healthcare industry in north - eastern region of India.
2) To identify future prospects of telemedicine in Assam.

8. Scope of the study

Telemedicine facilitates the provision of medical aid from a distance. It is an effective solution for providing specialty healthcare in the form of improved access and reduced cost to the rural patients and the reduced professional isolation of the rural doctors. Telemedicine can enable ordinary doctors to perform extra-ordinary tasks. 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. Telemedicine is a confluence of Communication Technology, Information Technology, Biomedical Engineering and Medical Science. The Telemedicine system consists of customised hardware and software at both the Patient and Specialist doctor ends with some of the Diagnostic Equipments like ECG, X-ray and pathology Microscope/Camera provided at the patient end. One of the major advantages of Telemedicine technology has been the saving of cost and effort to the rural patients as they are not required to travel long distances for obtaining consultation and treatment. Therefore, Telemedicine refers to the remote delivery of clinical care through electronic communications. The term was coined in the 1970s by the World Health Organization (WHO) as a mode of valid exchange of medical information pertaining to diagnosis, treatment and prevention of disease and injuries via information and communication technologies with the goal of improving patients' health status. Telemedicine cannot be considered a separate medical specialty; on the contrary, it is considered a tool to be used by healthcare providers to disseminate the traditional medical practice beyond the walls of the typical medical practice. Thus, this survey was confined to the patients of Apollo tele-clinic centres, Guwahati and to analyse the data has been collected. The study was done on convenient and judgemental sampling techniques with 100 employees as the sample size.

9. Limitations of the study

This paper on telemedicine has certain limitations due to the various reasons mentioned below. However, the researcher tries to overcome these limitations to arrive at a suitable solution for

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the successful completion of the thesis.
- Few of the respondents did not fill up the questionnaire therefore; it was not easy to reach in a better conclusion.
- Few patients showed lesser interest in providing information and have not cooperated.
- The conclusion got from this project is not universal and may not be applicable in any other organization.

10. Research methodology

This research focuses on the means and arrangement that depicts how, at what time and where information is to be collected and scrutinized. It involves all the approach including technique and methods of infection compilation, taken up by the researcher to answer the research problem. The researchers overall plan for acquire an answer to the research question or for testing the research question or for testing the research hypothesis is referred as the research methodology. It includes the steps, actions and approach, research design and setting of the study, population, sample, sample technique, data collection procedure, instruments, ethical consideration and plan for data analysis.

A. Research design

For this study the design used was descriptive. Descriptive design as the name itself implies, is conducted to describe something. This study describes the factors that lead to system of telemedicine existing in Apollo tele-clinic centres, Guwahati. Here the descriptive research was conducted to find out the information about the factor and to spot light the areas that need the management's attention.

B. Sources of data

Primary data: The objective of the study has been accomplished with the help of primary data collected from 100 patients. The pre-decided number of sample has been selected based on the convenient and Judgemental sampling method from various departments. The selected samples are met in person and the required data have been collected with the help of a structured questionnaire.

Secondary data: Secondary data was collected from company records, Magazines websites.

A structured questionnaire is used as a main research instrument for the study.

C. Analysis and interpretation

This survey is about identifying the benefits of using telemedicine in the healthcare industry with special reference to the North Eastern region in India. Moreover, it also tries to find and identify the future prospects of telemedicine in Assam. Therefore, this chapter on analysis and interpretation tries to analyse the data collected through survey questionnaire and personal interview. The clients of telemedicine have also been contacted over telephone for collecting of data and information only.

About 100 questionnaires were issued to be filled by the patients of Apollo tele-clinic centres about the benefits of telemedicine in Assam. It shows that about 70% of the patients actively participated in the survey and successfully completed the questionnaires. The patients of Apollo tele-clinic centres were asked some questions regarding the process of telemedicine through questionnaires. The responses from the patients are as follows:

Response for Question No. 1:
Did Telemedicine help in easy access of health care services of rural patients?

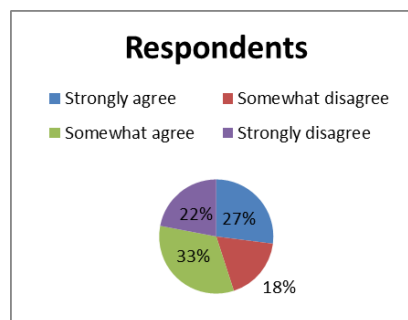| Options	No. of respondents	Percentage
Strongly agree	27	27%
Somewhat disagree	18	18%
Somewhat agree	33	33%
Strongly disagree	22	22%
Total	**100**	**100%**

Fig. 1. Respondents showing the percentage of easy access of health care services

Interpretation
From the above analysis it can be interpreted that 27% respondent has strongly agreed, 18% respondents has somewhat disagree, 33% respondents has somewhat agree and 22% respondents has strongly disagree.

Responses for Question No. 2:
Does telemedicine benefits only the urban community?

Options	No. of respondents	Percentage
Strongly agree	16	16%
Somewhat disagree	20	20%
Somewhat agree	34	34%
Strongly disagree	30	30%
Total	**100**	**100%**

Interpretation
From the above analysis it can be interpreted that 16% respondent has strongly agree, 20% respondents has somewhat disagree, 34% respondents has somewhat agree and 30% respondents has strongly disagree.
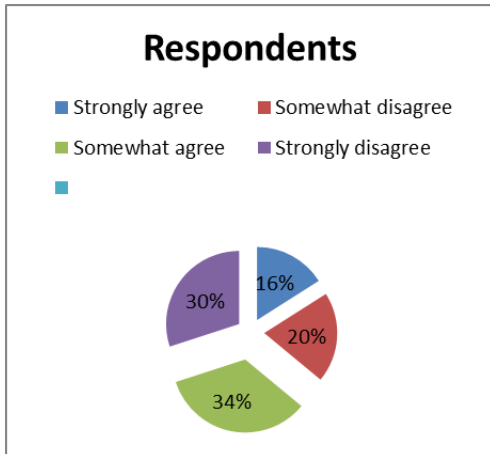
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Fig. 2. Telemedicine benefits in the urban community

Responses for Question No. 3:
Telemedicine can never replace face to face consultation?

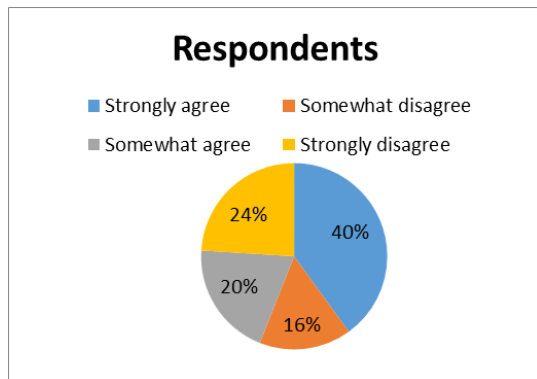| Options	No. of respondents	Percentage
Strongly agree	40	40%
Somewhat disagree	16	16%
Somewhat agree	20	20%
Strongly disagree	24	24%
Total	**100**	**100%**

Fig. 3. Replacing telemedicine with face-to-face consultation

Interpretation
From the above analysis it can be interpreted that 40% respondent has strongly agree, 16% respondents has somewhat disagree, 20% respondents has somewhat agree and 24% respondents has strongly disagree.

Responses for Question No. 4:
Telemedicine prevents from worsening of the medical condition of the patients?

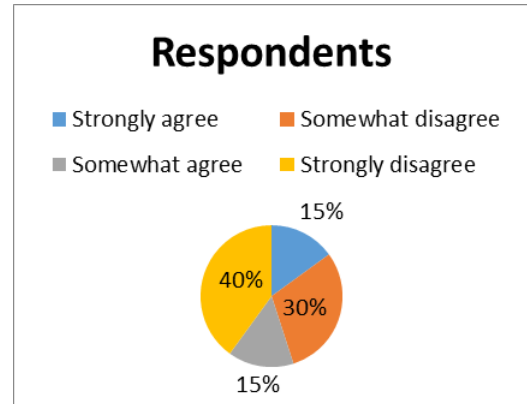| Options	No. of respondents	Percentage
Strongly agree	15	15%
Somewhat disagree	30	30%
Somewhat agree	15	15%
Strongly disagree	40	40%
Total	**100**	**100%**

Fig. 4. Telemedicine prevents from worsening of the medical condition of the patients

Interpretation
From the above analysis it can be interpreted that 15% respondent has strongly agree, 30% respondents has somewhat disagree, 15% respondents has somewhat agree and 40% respondents has strongly disagree.

Responses for Question No. 5:
Telemedicine should be implemented in all hospitals with internet facility?

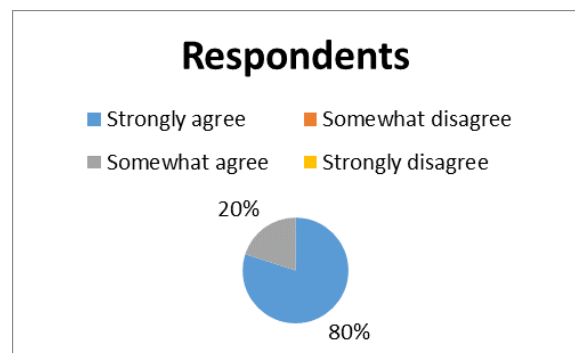| Options	No. of respondents	Percentage
Strongly agree	80	80%
Somewhat disagree	-	-
Somewhat agree	20	20%
Strongly disagree	-	-
Total	**100**	**100%**

Fig. 5. Implementation of telemedicine in all hospitals with internet facility

Interpretation
From the above analysis it can be interpreted that 80% respondent has strongly agree, and follow up 20% respondents has somewhat agree.

Responses for Question No. 6:
Telemedicine will increase of healthcare services for rural patients?

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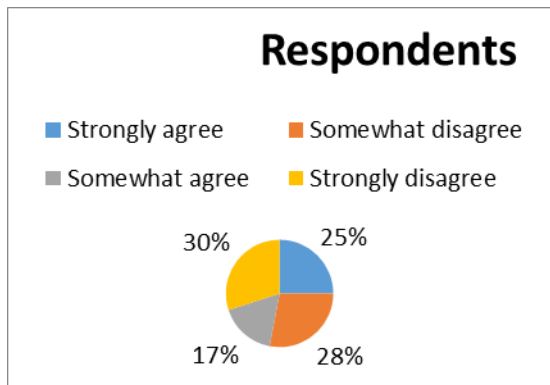| Options	No. of respondents	Percentage
Strongly agree	25	25%
Somewhat disagree	28	28%
Somewhat agree	17	17%
Strongly disagree	30	30%
Total	**100**	**100%**

Fig. 6. Telemedicine increase healthcare services for rural patients

Interpretation:

From the above analysis it can be interpreted that 25% respondent has strongly agree, 28% respondents has somewhat disagree, 17% respondents has somewhat agree and 30% respondents has strongly disagree.

Responses for Question No. 7:
Telemedicine will help patient to save money and time?

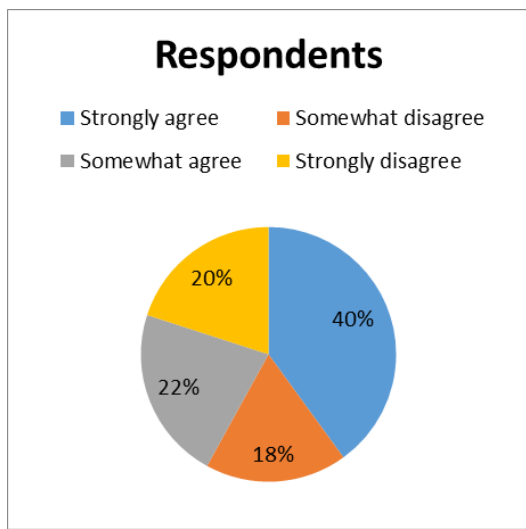| Options	No. of respondents	Percentage
Strongly agree	40	40%
Somewhat disagree	18	18%
Somewhat agree	22	22%
Strongly disagree	**20**	**20%**
Total	100	100%

Fig. 7. Telemedicine help patient to save money and time

Interpretation:
From the above analysis it can be interpreted that 40%

respondent has strongly agree, 18% respondents has somewhat disagree, 22% respondents has somewhat agree and 20% respondents has strongly disagree.

Responses for Question No. 8:
There will be loss of effective communication between Doctors and patients due to the distance between the two?

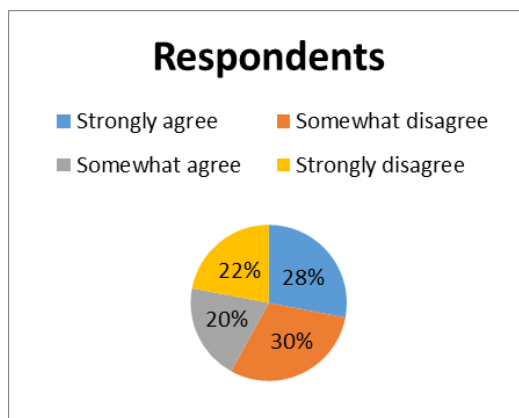| Options	No. of respondents	Percentage
Strongly agree	28	28%
Somewhat disagree	30	30%
Somewhat agree	20	20%
Strongly disagree	22	22%
Total	**100**	**100%**

Fig. 8. Responses showing the communication between doctors and patients.

Interpretation:

From the above analysis it can be interpreted that 28% respondent has strongly agree, 30% respondents has somewhat disagree, 20% respondents has somewhat agree and 22% respondents has strongly disagree.

Responses for Question No. 9:
Would you use telehealth again?
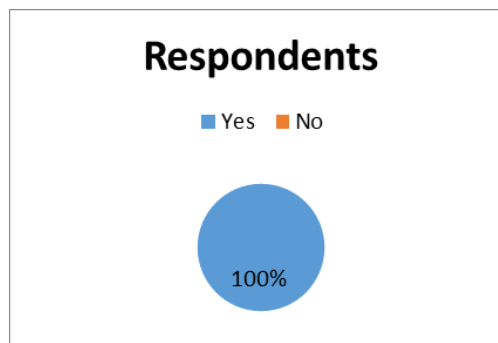
Options	No. of respondents	Percentage
Yes	100	100%
No		
Total	100	100%

Fig. 9. Responses showing telemedicine again

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Interpretation:

From the above analysis it can be interpreted that majority of respondent's response 100% on using tele-health again.

Response for Question No. 10:

Would you recommend telehealth to another person?

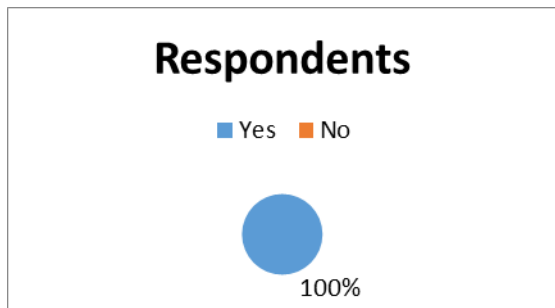| Options	No. of respondents	Percentage
Yes	100	100%
No		
Total	100	100%

Fig. 10. Responses showing recommending about telemedicine

Interpretation:

From the above analysis it can be interpreted that majority of respondents' response 100% on recommend tele-health to another person.

11. Findings of the study

The findings of the research can be depicted in the following manner.

- From the analysis carried out it can be found that the rural population can easily access the telemedicine in healthcare service.
- The result says that the maximum benefit is not only for the urban but it also benefits the rural community.
- Moreover, it shows that most of the clients prefer face –to-face consultation and telemedicine can never be replaced by face-to-face consultation.
- The findings clearly mentions that telemedicine somewhat prevents the worsening of the medical conditions of the patients.
- Each and everyone agrees that telemedicine facility should be implemented in the hospitals and it should have internet facilities for easy access.
- Respondents have strongly agreed that using of telemedicine save time and money in the long run.
- Findings clearly show that each and everyone who is using telemedicine is very much willing to use it again in the future.
- Respondents say that they will definitely recommend using telemedicine to their near and dear ones.

12. Conclusion

Telemedicine is a fascinating new development that enhances the level of medical and health services in general. Despite the rapid development and spread in telemedicine, more is still expected, especially in terms of providing service for countries in the developing world. Certain clear regulations and general policies and guidelines need to be established and internationalized to solve issues bounding the spread of telemedicine and concerning societies.

Telemedicine system help for positively in real time applications and it is enhanced for diagnosing for emergency problems. In the current scenario of rising healthcare costs, shortage of trained healthcare professionals, rising chronic diseases, application of ICT in healthcare sector in the form of telemedicine plays a vital role in improving the efficiency and effectiveness of healthcare system. The healthcare sector in India is facing a growing demand for diagnostic and expensive therapeutic resources. To meet such demand, measures such as data security solutions, portable equipments, collaboration of public and private sector can be adopted.

The presence of electronic interconnectedness in telemedicine allows physicians to keep a better record of patients' health. A large number of initiatives have been undertaken at the Government level along with other public and private organizations to use telemedicine as an effective tool to extend healthcare services and health education to people of India.

Thus, it can be said that telemedicine applications have a bright promising scope in India. An ideal integration of health care system and ICT tools will play an important role in redefining health care in India.

Annexure

This is a survey conducted as part of my Master Degree Thesis titled: "A study on the uses and future prospects of telemedicine in the healthcare industry in the north-eastern region of India with special reference to Assam". The information collected will be confidential and will be purely used for academic purpose only. I will be very much obliged if you spare some time for answering the following questions.

Name:

Gender:

Age:

1. Did Telemedicine help in easy access of health care services of rural patients?

i) Strongly agree ii) Somewhat disagree iii) Somewhat agree iv) Strongly disagree

2) Does telemedicine benefits only the urban community?

i) Strongly agree ii) Somewhat disagree iii) Somewhat agree iv) Strongly disagree

3) Telemedicine can never replace face to face consultation?

i) Strongly agree ii) Somewhat disagree iii) Somewhat agree iv) Strongly disagree

4) Telemedicine prevents from worsening of the medical

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condition of the patients?

   i) Strongly agree ii) Somewhat disagree iii) Somewhat agree iv) Strongly disagree

   5) Telemedicine should be implemented in all hospitals with internet facility?

   i) Strongly agree ii) Somewhat disagree iii) Somewhat agree iv) Strongly disagree

   6) Telemedicine will increase of healthcare services for rural patients?

   i) Strongly agree ii) Somewhat disagree iii) Somewhat agree iv) Strongly disagree

   7) Telemedicine will help patient to save money and time?

   i) Strongly agree ii) Somewhat disagree iii) Somewhat agree iv) Strongly disagree

   8) There will be loss of effective communication between Doctors and patients due to the distance between the two?

   i) Strongly agree ii) Somewhat disagree iii) Somewhat agree iv) Strongly disagree

Table 1
List of civilian Telemedicine centre in NER under ISRO-NEC joint Telemedicine program

State	Total nos. of Telemedicine centre commissioned under ISRO-NEC joint Telemedicine project	Location
Arunachal Pradesh	4 (Four)	• Ram Krishna Mission Hospital, Itanagar • General Hospital, Naharlagun • Civil hospital, Passighat • Civil Hospital, Tawang
Assam	7 (Seven)	• Guwahati Medical College & Hospital, Guwahati • Assam Medical College & Hospital, Dibrugarh • Jorhat Medical College & Hospital, Jorhat • Civil Hospital, Tinsukia • Civil Hospital, North Lakhimpur • Civil Hospital, Golaghat • Civil Hospital, Hailakandi
Manipur	1 (One)	• Regional Institute of Medical Science (RIMS), Imphal
Meghalaya	4 (Four)	• North Eastern Indira Gandhi regional Institute of Health & Medical Science (NEIGRIHMS), Shillong • Civil Hospital, Shillong • Civil Hospital, Jowai • Civil Hospital, Tura
Mizoram	4 (Four)	• Civil Hospital, Aizawl • Civil Hospital, Lunglei • District Hospital, Saiha • Civil Hospital, Champhai
Nagaland	1 (One)	• Civil Hospital, Mokukchang
Sikkim	1 (One)	• S.T.N.M. Government Hospital, Gangtok
Tripura	3 (Three)	• Sub-Divisional Hospital Dharmanagar • Civil Hospital, Kailsahar • Sub-Divisional Hospital, Kamalpur

Table 2
List of Telemedicine centre in NER under Indian Army

State	Total nos. of Telemedicine centre commissioned under Indian Army Telemedicine project	Location
Assam	2 (One)	• 151 Base Hospital, Basistha, Guwahati • Military Hospital, Silchar
Manipur	1 (One)	• Military Hospital, Liemakhong
Meghalaya	1 (One)	• Military Hospital, Shillong
Nagaland	1 (One)	• Military Hospital, Dimapur

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9) Would you use telehealth again?
i) Yes ii) No
10) Would you recommend telehealth to another person?
i) Yes ii) No
11) What are the benefits of using telemedicine?
 ----
12) How telemedicine will help in the development in the healthcare industry in Assam?

Beside this 31 (25 + 6) telemedicine centres, there are a number of telemedicine centre in NER commissioned by ISRO under different network. The locations of these centres are:

• Dr. B Barooah Cancer Institute, Guwahati, Assam
• Srisankardeva Nethrayalaya, Guwahati, Assam
• Tripura sundari District Hospital, Udayapur, Tripura
• Govt. Cancer Hospital, Agartala
• Naga Hospital, Kohima etc.

These telemedicine centres are providing noble services to the people of NER in health sector. Thousands of tele-consultancy and Continuing Medical Program (CME) has been carried out connecting many specialty and super-speciality hospitals like All India Institute of Medical Science, New Delhi; Narayana Hrudalaya, Bangalore; Amritha Institute of Medical Science, Cochin; Sri Ramchandra Medical College & Hospital, Chennai; Sanjay Gandhi Post Graduate Institute of Medical Science, Lucknow; Tata Memorial Centre, Mumbai; Fortis Hospital, Noida etc. A large nos. of patients as well as doctors are benefitted by this health service.

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