

Commercial aspect of Telemedicine in Indian scenario

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ABSTRACT: *Telemedicine (also referred to as "telehealth" or "e-medicine") was first introduced in the 1970s, when tele-electrocardiograms were communicated over telephone lines. Since then, telemedicine has come a long way in terms of both healthcare delivery and technology. It involves using electronic information to distribute health-related services when distance separates the participants. The Indian Space Research Organization has been deploying a SATCOM-based telemedicine network nationwide since 1999. During the COVID-19 pandemic, a countrywide lockdown in India reduced access to regular healthcare services. As a policy response, the Ministry of Health and Family Welfare rapidly increased the use of telemedicine. And now, India, with its diverse landmass, huge population, and large medical and IT manpower, has been found to be an ideal setting for telemedicine. For Low- or Middle-Income Country (LMIC), which includes India, investing in telemedicine is proven to be highly beneficial, making healthcare more accessible and unbiased in the future. Surely telemedicine cannot be a solution to all problems, but it can still reduce the burden on the healthcare system to a large extent.*

KEYWORDS – *Telemedicine, healthcare, India*

1. INTRODUCTION

Telemedicine is the interface where electronic information is used to provide and support healthcare to patients. “Tele” is a Greek word meaning "distance", and “modern” is a Latin word meaning “to heal”. Time magazine called telemedicine “healing by wire”. This was observed as a futuristic initially, but telemedicine is today a reality and has come to stay.

In the era of coronavirus disease 2019 (COVID-19), the need to reduce face-to-face consultations without compromising the quality and access to essential health services worldwide emerged. During COVID-19, Member States in different stages of digital health transformation were all highly engaged in telemedicine implementation[1][2].

Besides the pandemic, people living in rural and remote areas struggle to access convenient and suitable medical care. Almost 75% of the population of India resides in rural areas lacking access to medical proficiency and infrastructure. Moreover, healthcare delivery is difficult in unusual geographical terrain such as mountain regions in the northeast, deserts in the northwest, and the off-shore islands of Andaman and Lakshadweep[3][4]. Telemedicine's potential to provide healthcare access to rural populations and distant areas has been realized. Telemedicine promises to bridge the distance between remote areas and convenient medical help. Apart from patient care, telemedicine has a variety of applications in education, research, and administration.

As of now, many technical ministries of the Government of India, such as information technology, science and technology, and science-technology-information policy, have been experimenting with telemedicine projects. The Ministry of Health and Family Welfare has now adopted telemedicine into the National Rural Health Mission, an initiative to focus on the improvement of rural healthcare[5]. Throughout India, several telemedicine initiatives have been taken up by various organizations (both government and private sector) with federal and state funding[6].

2. EARLY TELEMEDICINE

Telemedicine is nothing new; instead, its application dates to the nineteenth century, when electrocardiography data was transmitted over telephone wires[7]. The military and space technology departments as well as private individuals used various commercial equipment for the development of telemedicine[8]. The television was used to facilitate relationships between specialists at psychiatric institutes and general practitioners at a state mental hospital. The airport medical centres received medical advice from a major teaching hospital. These can be viewed as early technological milestones in telemedicine.

The modern practice of telemedicine began with the inventions of the electrical telegraph and the telephone. The telephone was popular in no time, as dialling "911" or "112" granted faster access to emergency care. For the first time, telemedicine was introduced in the April 1924 issue of Radio News magazine, where a patient could communicate with a doctor, including through the use of heartbeat and temperature indicators. The first case of a real-time video telemedicine consultation was in 1959, to transmit neurological examinations via interactive telemedicine, used by the University of Nebraska[9].

3. IMPORTANCE AND BENEFITS IF TELEMEDICINE

The folks in Asian nations, significantly in rural and remote areas, are found to have trouble accessing timely medical treatment. The region of the country is characterized by densely populated areas because the geography of India is extremely diverse, with landscapes ranging from snow-capped mountain ranges to deserts, plains, hills, and plateaus.

Telemedicine reduces the inconvenience and price of patient transfers, thus, removing distance barriers and improving access to quality health services[10].

Besides that, telemedicine cuts back not only an inessential period for health professionals but also the isolation of rural communities by upgrading their information through tele-education or tele-information. It will additionally impart coaching and education via teleconferences.

With the increasing range of a doctor's unit charge, the less costly telemedicine consultation is necessary for many families. Anyone can afford such facilities[11][12].

Telemedicine, apart from being cost-effective, also saves time. With this, to spend less we would need lesser time waiting in lines and traveling.

Expedited transmission of MRIs or X-rays for a second opinion is now possible through telemedicine. Just an email, SMS, or video of a medical image would let you get other opinions from other doctors.

There are various diagnosis involved in telemedicine such as: tele-dermatology, tele-radiology, tele-cardiology, tele-pathology, remote ICU monitoring, ambulance monitoring, mobile telemedicine unit and electronic health record[13].

Tele-dermatology is a technology that consists of videoconferencing for the patient to interact with the physician online. This allows the patient to receive immediate medical advice and the helper can verify their medical history.

Tele-radiology is where medical images can be transferred from patient to any suitable distant location for the purpose of checking, verifying and interpreting their condition, thus giving a diagnosis.

Tele-cardiology allows patients that carry an implantable medical device, such as a pacemaker or cardiac defibrillator, to be monitored by any cardiologist, as long as they have access to a computer or smartphone and reliable internet access. This helps to detect and monitor arrhythmias and multiple coronary heart disease risk factors such as hypertension or hypercholesterolemia during treatment.

Telepathology is the practice of pathology from a distance. This is done by visualizing an image on a video monitor rather than viewing a specimen directly through a microscope.

Remote ICU monitoring is the ability to monitor certain aspects of a patient's health from their own home. Remote patient monitoring cuts down on patients' travel costs and infection risk. This also allows easy management of acute and chronic conditions[14][15][16].

Ambulance monitoring is the tracking of ambulances using GPS systems. This allows the patient to know about the whereabouts of the ambulance when needed[17][18].

Mobile telemedicine units refer to the technology of transferring the electronic medical record of the patient from mobile telemedicine units to specialty hospital on real time, including medical images and investigation reports. They serve at the door steps of rural patients and are equipped with necessary diagnostic equipment.

An Electronic Health Record (EHR) is a type of collection of various medical records of a patient. These records are from all clinical encounter or events.

4. TYPES OF TELEMEDICINE

There are mainly three types of telemedicine: include store-and-forward, remote monitoring, and real-time interactive services. Every one of them has a role in medical care which when utilized properly can be beneficial for both healthcare workers and patients.

The store-and-forward telemedicine is an asynchronous telemedicine. Here the sender stores the information databases and then sends it to the receiver at convenient time. Next the receiver can view the data according to

his/her convenience. This practice is common in the medical fields of dermatology, radiology, and pathology saving time and allowing medical practitioners to serve the public with their services easily. There are some risks involved even though this is cost effective. Since the tests are conducted by the patients themselves, they may be inaccurate; however, the outcomes are generally thought to be like professional-patient tests.

Remote monitoring is also known as self-monitoring or self-testing. This uses a multitude of technological devices that can monitor the health and medical signs of a patient remotely. This is applied in managing a range of chronic diseases such as cardiovascular disease, diabetes mellitus, and asthma.

Real-time interactive services are a synchronous telemedicine. Here the sender and receiver both are online simultaneously at the same point of time and 'live' transfer of information occur. There are different mediums utilized for this type of telemedicine, comprising phone, online, and home visits.

5. TELEMEDICINE IN INDIA

The ISRO (Indian Space Research Organization) was the first organization to begin use of telemedicine in India. The Telemedicine Pilot Project in 2001, joined the Apollo Rural Hospital of Andhra Pradesh with the Chennai's Apollo Hospital. Ministry of External Affairs, ISRO, Department of Information Technology (DIT), Ministry of Health and Family Welfare and the state governments took some initiatives that was essential for development of telemedicine services in India. ISRO's telemedicine network has progressed a lot with increased number of remote nodes. The remote nodes include almost all geographical terrains of India, like the islands of Andaman and Nicobar and Lakshadweep, the hilly ranges of Jammu and Kashmir, Medical College hospitals in Orissa and some of the rural hospitals in other states.

In southern India, Kerala Oncology Network (Onconet- Kerala) telemedicine project was completed by the Centre for Development of Advanced Computing and Regional Cancer Center in Trivandrum. It had aimed to survey the role of telemedicine in the early detection of cancer, its treatment, and other services. This project created a web-enabled Hospital Information System 'TEJHAS' (Telemedicine Enabled Java-based Hospital Automation System). This is an electronic database of patients' medical records for it to be easily accessible to all the medical centers in the region. Thus, the online data sharing of electronic medical records, and radiology images between the nodal health care centers and regional cancer centers was possible easily. After the success of Onconet - Kerala, the Indian government decided to implement the ONCONET-India network. Here, 100 remote-site peripheral healthcare centers connected with 25 regional cancer centers across India. This project aimed to create a knowledge network of all over India for oncology services. It provides telemedicine services for cancer treatment. ISRO is setting up the technological expertise through such projects to create further telemedicine networks in India. Clear chart is given in fig 1 below[19].

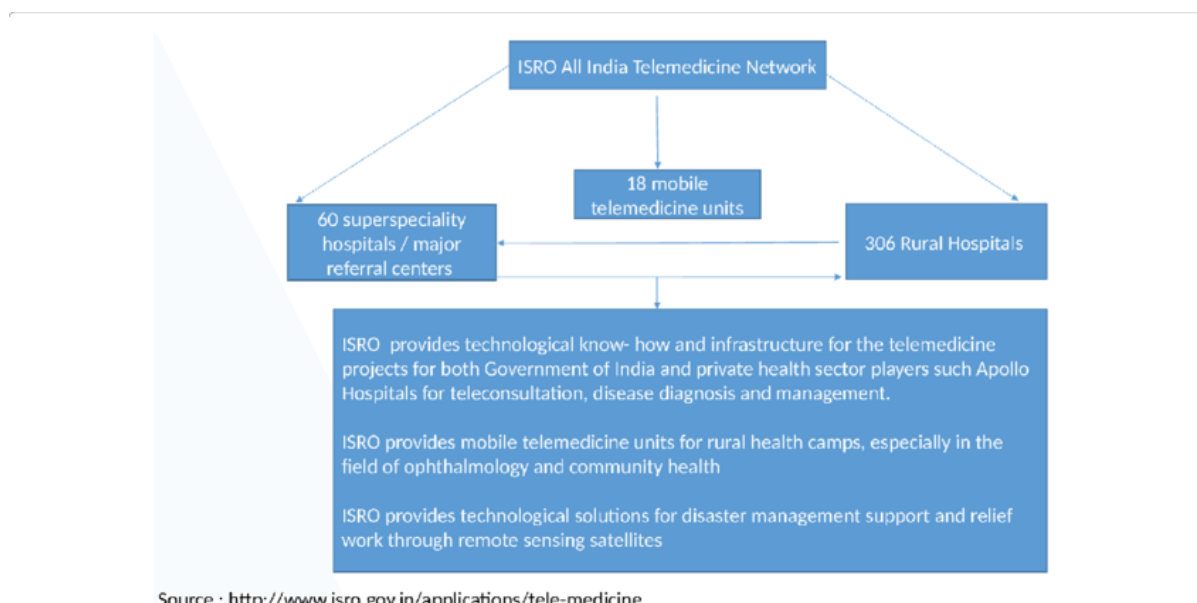


Figure 1

The private healthcare industry on recognizing the potential of telemedicine, established various such projects. The government and private enterprises in India are shown in fig 2 below.

Telemedicine in India : Role of government and private enterprises

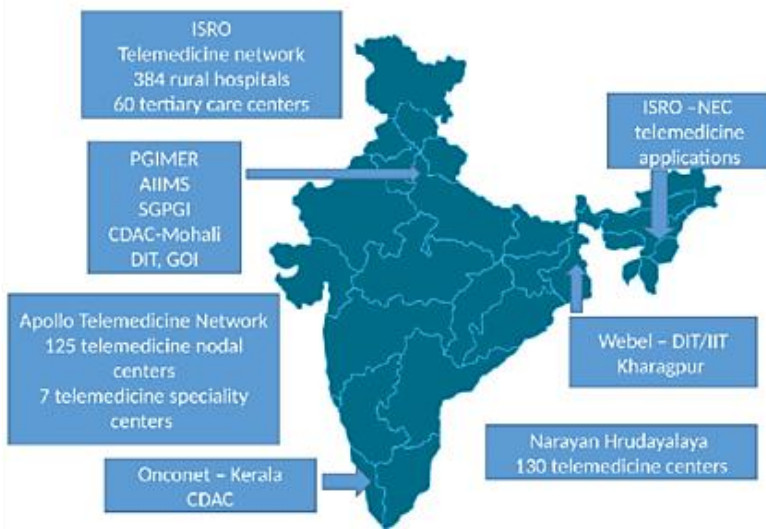


Figure 2

Ministry Of Health & Family Welfare (MoH&FW4) has executed Integrated Disease Surveillance Project networking of all district hospitals with medical colleges of the state focusing on disease surveillance. It is aiming to provide healthcare to rural people with the help of National Rural Telemedicine Network (NRTN). Various states are also cooperating with the central government to initiate statewide telemedicine networks, thus, strengthening the healthcare facilities in their states. State with their information in details is given below in fig 3 and fig 4[20].

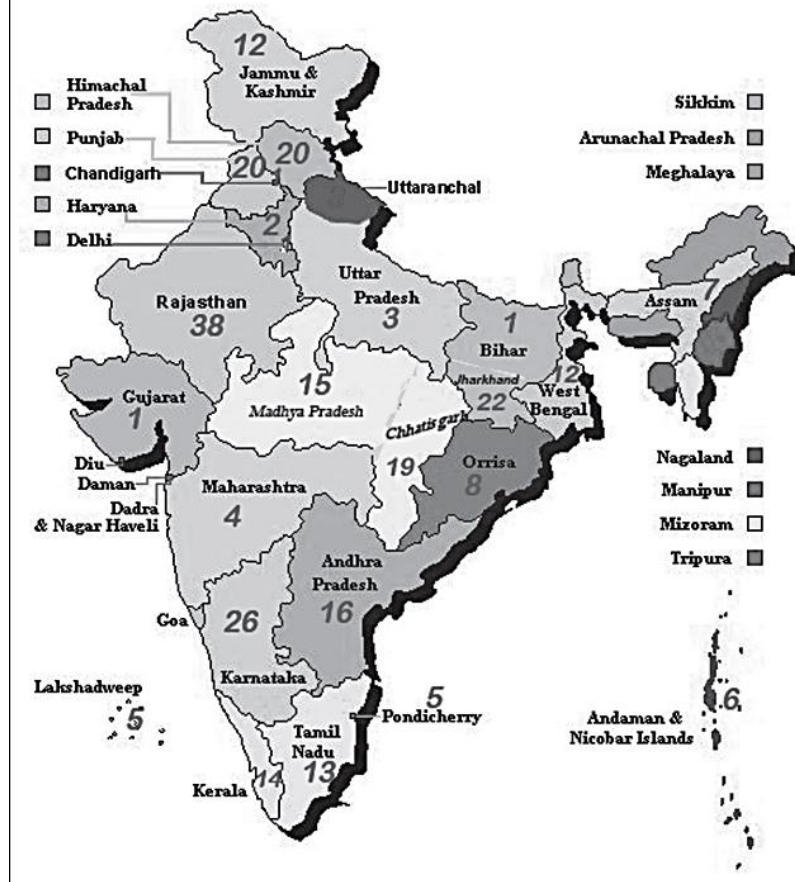


Figure 3

NAME OF THE STATE GOVERNMENT	FUNDING AGENCY	NO. OF TELEMEDICINE NODES	SPECIALTY HOSPITAL
Jammu and Kashmir	ISRO	12 District hospitals	Sher-e-Kashmir Institute of Medical Sciences Hospital, Srinagar
Himachal Pradesh ⁵	DIT	19 Health centers at district, block, and tehsil headquarters	IGMC Shimla and PGIMER Chandigarh
Punjab ⁶	DIT	20 District hospitals	Government medical college and hospital and five polyclinics of the state
Uttarakhand ⁷	State	2 District hospitals	SGPGIMS, Lucknow
North Eastern States	DIT	District hospitals each of seven North eastern states	Narayana Hrudayalaya, Bangalore
Jharkhand	ISRO	22 District hospitals	3 Medical colleges & hospitals
West Bengal	DIT	12 District hospitals	School of Tropical Medicine, NRS Medical College Et Hospital, Kolkata, Burdwan Medical College & Hospital, Burdwan
Rajasthan ⁸	ISRO	32 District hospitals	6 State medical colleges
Chhattisgarh ⁹	ISRO	Two at medical colleges	Government medical colleges at Raipur & Bilaspur that further link to premier hospitals of the country
Orissa ¹⁰	ISRO, C-DAC	5 District Hospitals	3 Medical colleges that further linked with SGPGIMS
Karnataka	ISRO	26 District hospitals	Narayana Hrudayalaya, Bangalore
TamilNadu		6 District hospitals	Government General Hospital, Royapettah Hospital, Adiyar Cancer Center ¹¹ —all at Chennai
Kerala	ISRO, C-DAC	14 District hospitals and two taluk hospitals	AIIMS, New Delhi, Amrita Institute of Medical Sciences (AIMS), Kochi, and Sri Chithira Tirunal Institute of Medical Science and Technology, Thiruvananthapuram

ISRO, Indian Space Research Organization; DIT, Department of Information Technology; PGIMER, Post Graduate Institute of Medical Sciences; SGPGIMS, Sanjay Ghandi Postgraduate Institute of Medical Sciences.

Figure 4

6. FUTURE PERSPECTIVE

There already has been so many projects like South Asian Association for Regional Cooperation (SAARC) and PanAfrican e-Network Project[21]. And the Indian government is planning for more such national level projects in India to facilitate healthcare in every area of this country(rural or urban). In March 2022, India completing 170,000 teleconsultations in a single day through its nationwide telemedicine service: “eSanjeevani”. Such telemedicine support enriches our country and brings us the opportunities we would have otherwise missed.

Thus, we are sure that the future perspective of telemedicine in India is no doubt bright and efficient. It has the capacity to control epidemic diseases in future[22]. Not only in health sectors but also in various other commercial sectors, telemedicine is and will continue to be the support no one knew we needed.

There is still a challenge that is faced by telemedicine which is prohibiting telemedicine from worldwide acceptance. That is the validation of the impacts we would have upon the medical results with science. Plenty other issues are surety of payment, benefit analysis and standardization of tools and methods that can be used for service delivery.

We already have started to include various other technologies with telemedicine like internet of things and cloud computing[23]. In future, we wish to see a multitude of projects incorporating telemedicine and IoT. There are already many such equipment as in wearable systems, vests, and others[24][25][26][27].

7. CONCLUSION

In this paper, we have discussed the commercial aspect of telemedicine in India. We analyzed the need and benefits and learned how it began all together. The detailed state nodes of telemedicine were provided. We even came to know about the typed of telemedicine and discussed its future perspective in India.

With such huge population and heterogeneous geography, telemedicine in India was possible only because of high-tech telecom links and speedy satellites and resources. We are almost amazed by its success in India and performance in world tells us that it holds the key to universal healthcare along with other benefits[28][29]. Even the World Health Organization(WHO) recognized the significance of telemedicine. But because of the lack of any legislation regarding telemedicine in India, it is managed with the help of medicinal practices and their associated laws[30]. Although telemedicine is not a solution to everything, it has helped us overcome a lot of challenges regarding healthcare in India[31]. Hopefully with increase in awareness we can solve all the challenges we have regarding telemedicine that will give us exquisite results in commercial aspects.

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