**Telemedicine- Start-up Ecosystem in India and its prospects**

**Abstract**

Information Technology has substantial prospects as a tool to improve the delivery of healthcare in India. Healthcare industry has seen an upswing in technological advancement and innovation in past few years which includes decision support tools, health informatics, electronic health records which are in highly availed by service providers and healthcare workers. The use of telecommunication and information technologies to provide remote medical services, has emerged as a promising tool for healthcare delivery in India. After the COVID19 pandemic, the adoption and utilization of telemedicine have accelerated significantly around the world as well as in India, leading to significant changes in healthcare delivery (Jaya Sahu, 2023). Telemedicine can be defined as the use of information and communication technologies to monitor and treat patients instead of a patient’s physical visit to the healthcare provider (Perednia & Allen, 1995). Telemedicine is intended to connect patients with medical practitioners and overcome geographical barriers (Craig & Patterson, 2005). This chapter is intended to study the various benefits, challenges, and prospects in telemedicine start-ups in context to Indian market.

**Keywords**- Telemedicine, Tele-health, E-Health, Telemonitoring, M-Health.

**Introduction**

WHO estimates a projected shortfall of 10 million health workers by 2030, mostly in low- and lower-middle income countries. Providing equitable and quality healthcare service which is accessible and affordable, in an infrastructure and personnel shortage, to 1.3 billion Indians is a challenge (Arvind Kasthuri, 2018). The COVID-19 pandemic has resulted in telehealth being widely accepted and the pandemic has brought the potential of telemedicine to the forefront. Despite a lot of factual justifications in favour of telemedicine in developing nations, its utilization is still disappointingly low. To offer solutions to enhance the ease and rate of adoption of telemedicine in India it is important to recognize the barriers in acceptance (Sonika Bakshi and Urvashi Tandon, 2020).

**Definition and Concepts**

Time magazine referred telemedicine “healing by wire.” “Tele” is a Greek word meaning “distance “and “mederi” is a Latin word meaning “to heal”. Telemedicine has a variety of applications in patient care, education, research, administration, and public health (Krishnan Ganapathy and Aditi Ravindra, 2009). Telemedicine is the use of electronic information to communicate technologies to provide and support healthcare when distance separates the participants (Brown, 1995). The World Health Organization (WHO) defines Telemedicine as, “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.”

Sometimes the word “Telehealth” is used synonymously with telemedicine. Telehealth “the use of electronic information and telecommunications technologies to support long distance clinical healthcare, patient and professional health-related education, public health and health administration” (**Kumekawa**, **2000)**

**History of Telemedicine**

The National Aeronautics and Space Administration (NASA) played an important part in the early development of telemedicine (Rashid Bashshur,1980). Physiological parameters were transmitted from both the spacecraft and the space suits during missions in the early 1960s (David S Watson, 1989). Telemedicine started in India formally with Bill Clinton commissioning the world’s first VSAT enabled village hospital at Aragonda on March 24, 2000 (Richard E Scott, 2015). The Ministry of Health in the Government of India has taken up projects like Integrated Disease Surveillance Project (IDSP), National Cancer Network (ONCONET), National Rural Telemedicine Network, National Medical College Network and the Digital Medical Library Network,in an endeavour to integrate the available public health data and provide easy access to healthcare services.( Saroj Kanta Mishra et al., 2009)

“Contactless medicine” was advocated worldwide with the notification of COVID-19 as a pandemic, resulting in various new strategies in providing healthcare services (John Camillus et al, 2021). A few significant and successfully established telemedicine services in India includes surgical services at Sanjay Gandhi Postgraduate Institute of Medical Sciences, School of Telemedicine and Biomedical Informatics, and many more.[ Saroj Kanta Mishra, 2004], mammography services at Sri Ganga Ram Hospital, Delhi; oncology at Regional cancer center, Trivandrum;( Sudhamony S et al.,2008).Telemedicine is also used in places of periodic large gathering, to provide medical assistance; for example, practices telemedicine during Maha Kumbhamelas by the Government of Uttar Pradesh.[ Saroj Kanta Mishra et al.,2004] Telemedicine can provide effective solutions to various issues by providing timely access to the healthcare provider, reducing the time, cost and risk of infection associated with travel.. Some other major Indian private sector players in telemedicine include Apollo Telemedicine Enterprises, Asia Heart Foundation, Narayana Hrudayalaya, Escorts Heart Institute, Amrita Institute of Medical Sciences and Aravind Eye Care (Kedar Mehta, 2013). The implementation of telemedicine in India had not been able to make much progress mainly due to lack of regulatory framework despite of all the efforts by the Government of India to promote telemedicine. However, Ministry of Health and Family Welfare on 25 March 2020, made a significant move by issuing the Telemedicine Practice Guidelines for enabling registered medical practitioners to provide health care using telemedicine. This has paved the way for successful implementation of telemedicine solutions in the current Indian scenario (Medical Council of India, 2020).The Telemedicine services in India comes under the jurisdiction of Ministry of Health and Family Welfare and the Department of Information Technology. Telemedicine division of MoHFW, GOI has set up a National Telemedicine Portal for implementing a green field project on e-health establishing a National Medical College Network (NMCN) for interlinking the Medical Colleges across the country with the purpose of e-Education and a National Rural Telemedicine Network for e-Healthcare delivery(Telemedicine and e-health portal ). National Digital Health Authority of India (NDHAI)/National e-health authority (NeHA) is being set up with a vision of achieving high quality health services for all as a constituent of the e-health wing of the National Health Portal (NHP). MoHFW has developed a set of Electronic Health Records (EHR) standards in 2013 and a revised version of the same in 2016( National Health Portal of India, 2018). AROGYASREE, an initiative of Indian Council of Medical Research (ICMR) is another internet-based mobile telemedicine conglomerate that integrates multiple hospitals, mobile medical specialists, and rural mobile units/clinics (Bansi L. Raina, 2020)

**Typology**

Telemedicine services can be classified based on the timing of the information transmitted and the interaction between the individuals involved.

1. Real time or synchronous telemedicine: The sender and receiver both are online at the same point of time and ‘live’ transfer of information occurs.
2. Store-and-forward or asynchronous telemedicine: The sender stores the information databases and sends it to the receiver at a convenient point of time, and the receiver can review the data according to his convenience.
3. Remote Monitoring type of telemedicine: known as self-monitoring or self-testing. Remote monitoring uses a range of technological devices to monitor health and clinical signs of a patient remotely.

**Advantages of telemedicine** (Debjit Bhowmik, 2013)

The main objective of telemedicine is to cross the geographical barries and provide healthcare facilities to rural and remote areas (health for all) so it is beneficial for the population living in isolated communities. Besides these other advantages telemedicine are

• Eliminate distance barriers and improve access to quality health services In emergency and critical care situations where moving a patient may be undesirable and/or not feasible

• Facilitate patients and rural practitioners’ access to specialist health services and support

• Lessen the inconvenience and/or cost of patient transfers

• Reduce unnecessary travel time for health professionals

• Reduce isolation of rural practice by upgrading their knowledge through tele-education or tele-CME

**Availability of Technology**

The basic system needed for implementation of telemedicine are hardware, software, and telecommunication link, which are now available at considerably reduced price. Most of these costs are well within the reach of most of the organizations. Components of telemedicine can be described as follows

Connectivity

Connectivity

The general setup of telemedicine solutions comprises of three parts—patient end, communication medium and healthcare provider end (specialty centre). The telemedicine component at the patient end, there are devices such as desk-top computer, personal assistance device, mobile phone, tablets with the telemedicine software installed, that can perform user authentication, acquisition, storage, retrieval, and transfer of patient's biomedical data. Such as patient's vital signs (temperature, heart rate, respiratory rate, blood pressure and oxygen saturation) and electrocardiogram. At the healthcare provider end, the hardware and software installations are the same as patient end, allowing authenticated logging-in of the specialist and storage of biomedical data for offline usage. Depending on the bandwidth, connectivity, and availability, many types of connection media are being used. (Deepa Prabhu et al., 2009). When setting up a telemedicine network, a suitable bandwidth is very critical. Bandwidth is the ability that predicts how promptly bits of data may be sent down the pathways of a telecommunication channel. An exciting decade for telemedicine began with 2020, particularly with the development and maturation of, several emerging technologies which included robot and blockchain technology (Douglas heaven,2019), big data analytics (Smadar shilo,2020), internet of things (IoT), 5G networks (Daniel SW Ting,2020), artificial intelligence (AI) (Yoshua Bengio,2021), , which can be applied synthetically to tackle major health issues or diseases. The home-based remote health monitoring application became an important branch of health IoT development which integrates physiological signal sensors, wireless communication technology, and cloud computing, replacing the traditional health monitoring model (Ming Guo et al.,2018). Health monitoring is possible anytime and anywhere as the data collected by the sensors can be transmitted to mobile phones, which are connected via Bluetooth to the sensor nodes, and the received data is then send to the health management service platform (Mohammed K. Hassan, 2019).

**Prospects**

The rapid evolution of wearable devices and remote monitoring technologies is expected to expedite the expansion of telemedicine in India. The advancements in technology, changes in healthcare policy, and the evolving needs of patients and healthcare professionals are some of the factors which can shape the future of telemedicine in India. Additionally, the combination of the artificial intelligence and machine learning with telemedicine can result in improved treatment outcome. Telemedicine has significant potential in the area of chronic disease management, in addition to tele-behavioural health and specialty telemedicine.

Many telemedicine startups have emerged in India in recent years especially after the COVID 19 pandemic, offering a range of services like remote health monitoring, virtual consultations, online medicine delivery, diagnostic report delivery etc.

Some of the telemedicine apps that are widely used in India in current scenario are

1. Practo: Practo is a leading telemedicine app in India. It allows its users to find and consult with doctors online, also offers features such as online consultations, e-prescriptions, and appointment scheduling.

2. mfine: mfine is an AI-powered telemedicine platform that connects patients with doctors through video consultations. It offers services across various specialties and allows users to maintain electronic health records.

3. DocsApp: DocsApp is a telemedicine platform that provides online doctor consultations 24/7

4. Pharmeasy: It have a huge number of medicines of different categories which are sent through retail stores at doorsteps.

5. 1mg: Although primarily known as an online pharmacy, 1mg also provides teleconsultation services. Users can consult with doctors through video or audio calls and get e-prescriptions for medications.. 6. Lybrate: Lybrate is a telemedicine app that enables users to consult with doctors through text, voice, or video calls.

5.NetMeds: Founded by parent company called Dadha & Company, which is in pharmaceutical business for 100years.NetMed was popular during COVID-19 lockdown in Northern India.

6. E-Sanjeevani: It is an initiative by Kerela government launched during COVID-19 pandemic.

7. mChemist: mChemist is again a drug delivery application which provide a wide variety of drugs and products and also offers free Diabetes counselling for their user.

9. AskApollo: Launched by Apollo line of hospitals and is one stop healthcare facility for consultation, laboratory appointment.

**Regulatory Framework**

Telemedicine practice can prevent the transmission of infectious diseases reducing the risks to both health care workers and patients. Realizing its potential in health-care delivery, the Board of Governors of Medical Council of India (MCI) has adopted the “Telemedicine Practice Guidelines” which include both the overarching principles and a practical framework of telemedicine. While the overarching principles would be common to all future guidelines, the latter specifically tries to address the current need in the wake of COVID-19 outbreak. Accordingly, the same has been included as an amendment to the Indian Medical Council (Professional Conduct, Etiquette and Ethics) Regulations, 2002, and has been approved by the Ministry of Health and Family Welfare, Government of India officially on March 25, 2020(Telemedicine Practice Guidelines, 2020)

**Constraints of Telemedicine**

Apart from the many advantages telemedicine also have some limitations. Many doctors believe that technical issues are the main barrier encountered in telemedicine. In the absence of a physical examination, doctors are not 100% sure about the initial diagnosis because any important sign or symptom may be missed (Mahendra Kumar, 2022). The most common concern with telemedicine is the lack of physical interaction between doctor and patient and missing the “human touch” (Devin M Mann et al., 2020). There is also an urgent need to improve the awareness about telemedicine and strong technical support to service providers and end-users for a sound experience of consultation (Elanor Layfield et al, 2020). Despite the growth of telemedicine in India, there are still several challenges that need to be addressed. These include issues related to internet connectivity, digital literacy, and the need for clear guidelines and regulations to ensure. the quality and safety of telemedicine services.

**Conclusion**

 Telemedicine emerging as a promising tool for healthcare delivery particularly in India, especially after the COVID-19 pandemic. Telemedicine is an umbrella program that encompasses any kind of medical activity involving the element of distance. It offers several benefits, including increased accessibility to healthcare services, improved patient outcomes, and cost cutting. However, telemedicine also has several challenges, like the need for secure and reliable technology and the lack of digital literacy among patients and healthcare professionals. The continued development of telemedicine in India is likely to have significant implications for healthcare delivery and patient outcomes. Smart robots with artificial intelligence will help conduct or interpret laboratory tests and other tasks performed at home with networked diagnostic devices. ICT devices and remote sensors will offer the opportunity to standardize and equalize health care, making the system resilient. Technology-enabled care will increase productivity and savings, improving health outcomes. Continuum of health care will provide individualized care maximizing resources. Overall, the development of telemedicine in India is an important step forward in expanding access to healthcare, particularly in rural and remote areas where access to healthcare services may be limited. While there are still challenges to be addressed, the future of telemedicine in India looks promising.

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