Role of ICT in Medical Technology to Improve Healthcare Delivery

Imran Banat [1], Dr. Kandi Sravan Kumar[2]

[1]Research Scholar, OPJS University, Churu, Rajasthan
[2]Assistant Professor, OPJS University, Churu, Rajasthan

Abstract

In India, medical technology has been in use for at least a decade. Healthcare, particularly public health, has become increasingly reliant on information and communication technology (ICT). The prices of ICT equipment are decreasing on a general basis. The current study is a review of numerous research on the use of Telehealth. Based on the data supplied, it also attempts to describe how people use the service. As telemedicine advances, the primary goals are to develop new tools and technologies to improve healthcare delivery for underserved populations, increase access to medical specialty services while reducing healthcare costs, and provide training for healthcare providers, trainees and students in health-related fields. Telehealth stakeholders, such as patients, patient communities, researchers, healthcare providers, professional societies and industries, healthcare management/economists, and healthcare policy makers need and want these tools and technologies because of the growing need and interest in collaborating on telehealth research.

Keywords: *Management, Telehealth System, Digital, Technology.*

1. INTRODUCTION

A person's life is transformed by technology. It gives people the ability to take charge of their own destiny while still fostering interpersonal relationships. Whether it's reducing poverty, streamlining procedures, or eliminating corruption, technology has an important role to play in every aspect of our lives. It is a vital tool in the development of human culture. On July 2, 2015, the Indian government unveiled the "Power to Empower" slogan for its Digital India campaign. The program's goal is to promote electronic service expansion that benefits the whole population. This initiative aimed to help the country's citizens become more digitally connected by giving them with access to a variety of facilities and services. In order to link rural and urban regions via network devices and services, the goal is to equip people with modern digital and electronic technology. As a result, there will be an increase in the number of jobs available in the nation. As the nation develops toward becoming a digitally empowered economy, considerable technical developments and improvements are needed to link the whole country online.

2. LITERATURE REVIEW

Abid Haleem et.al (2021) Due to travel expenses, regular medical visits in remote locations might be prohibitively costly. People prefer telemedicine in the wake of the Covid-19 Pandemic because it eliminates the need for face-to-face contact. Even if medical visits may be decreased by using video conferencing or other virtual technologies, it's a good thing that telemedicine is available. It saves both the patient and health care practitioner time and money by using telemedicine, which is a win-win situation for everyone. Furthermore, because of its speed and advantages, it may improve the efficiency of hospitals and clinics. This new technology would make it simpler to monitor and manage the recovery of patients who have been released from the hospital. Thus, telemedicine provides a win-win scenario for both the patient and the provider. Research in this article will focus on the key capabilities, characteristics with treatment process, and challenges to its implementation in healthcare. The authors of this study list seventeen noteworthy uses for telemedicine in the healthcare industry. Patients in distant areas may be diagnosed and treated by a telemedicine physician. Patients and physicians both benefit from using health apps for planned follow-up appointments, which enhances the likelihood of follow-up, reduces missed appointments, and optimizes patient outcomes. Using the high-definition audio-video system, patients may show their doctor any obvious rashes, bruises, or other symptoms that need care. In addition, a file management system and a payment gateway system are required for practitioners. Patients and physicians may jointly review the therapy process thanks to telemedicine. However, this technology is not a replacement for a physical consultation; rather, it is meant to augment it. In the event of a pandemic, people who are unable to see a doctor or stay at home may feel secure using this technology.

Bokolo Anthony Jnr et.al (2020) Resources at medical facilities have been stretched thin by the present pandemic of coronavirus illness 2019 (COVID-19). Because of the necessity to diagnose, treat, monitor, and follow up on patients during a pandemic, there is growing concern in reducing and managing COVID-19. Medical treatment has changed dramatically and swiftly as a result of the COVID-19 epidemic. Telemedicine and virtual care, both of which relate to the use of ICT (Information and Communications Technology) to offer healthcare services digitally or remotely, are presently being rapidly adopted by medical facilities in response to COVID-19. Medical professionals and patients alike are likely to benefit from telemedicine's ability to provide timely treatment while limiting the risk of exposure. A fast literature analysis was done, and 35 articles published between January 2019 and May 2020 were used to give theoretical and practical evidence on the importance of employing telemedicine and virtual care for distant treatment of patients during the COVID-19 pandemic. Using telemedicine and virtual care during the COVID-19 epidemic is outlined in this article. There are implications for the near future of consolidating virtual care solutions that will help integrate digital technology into healthcare, as this research demonstrates.

Raj Kishor Kustwar et.al (2020) When it comes to telemedicine, we've gone a long way since the first system was established in Boston in 1967, making it possible for doctors and patients to communicate at a distance. Because of its status as a developing nation, India now has an acute scarcity of physicians, nurses and midwives as well as a lack of adequate healthcare facilities. The vast majority of India's population lives in distant and rural areas without access to basic health care. As a result, telemedicine has the potential to overcome the rural-urban gap in health care for the poorest residents of India. Concerns about whether telemedicine technology can accomplish its goal of providing appropriate healthcare services to the underserved rural and distant populations are high. It is the purpose of this article to provide an outline of this topic.

Vinoth G. Chellaiyan et.al (2019) For low-income locations, telemedicine is a way of delivering considerable healthcare via remote diagnosis and treatment of patients through telecommunications. Electronic cardiography (ECG) was the first kind of telemedicine to be documented in print during the first part of the twentieth century. Telemedicine has gone a long way since its inception, both in terms of healthcare delivery and in terms of the technology that supports it. NASA and the Indian Space Research Organization (ISRO) played a significant part in this. In 2005, India's Health Ministry established the National Telemedicine Taskforce, which prepared the path for programs like ICMR-AROGYASREE, NeHA, and VRCs. Additionally, telemedicine aids primary care physicians by making it easier for them to consult with specialists and to closely monitor their patients.

Surya Bali (2018) There has always been a pressing need for affordable, accessible, available, and high-quality health care services. Regardless of a country's financial situation, the subject of health care is always a top priority for the government. To ensure that everyone has access to high-quality health care at a price they can afford, policymakers, administrators, and researchers are working nonstop. However, despite the widespread use of alternative tools and technology to increase access to high-quality healthcare, quality and cost are still major concerns in developed nations. Health care in developing nations is lagging behind developed countries in embracing new technologies that might cut costs and enhance quality. It has arisen as a new promise for removing healthcare bottlenecks via the use of telemedicine. Without sufficient planning and strategy, developing nations have embraced telemedicine technology. Over the last two decades, poor nations have tried and failed to use telemedicine in an effort to lower healthcare costs and increase access to treatment. Telemedicine in impoverished nations has several challenges, as this chapter has attempted to examine. In order for governments to fully grasp the problems with telemedicine deployment and come up with effective solutions, it is essential that these obstacles be properly identified and described.

3. TELEMEDICINE IN INDIA

Primary healthcare services in remote areas of India may be provided using telemedicine at low prices, which is the goal of the program.

Telemedicine makes use of two different kinds of technologies. When two or more people share prerecorded information at various times and places, this is known as Asynchronous type technology. 'Store and forward' is another name for this technique. A digital camera is a device that captures photos on a computer's hard drive, which are afterwards transferred to another place. Tele-radiology, telepathology, and tele-dermatology are all possible applications of this technology. The other is a technology of the Synchronous kind, in which data is shared in real time. Patient and telemedicine coordinator are both in one location, but the expert is at a different, referral location. Real-time consultations may be held at both sites thanks to videoconferencing technology. In psychiatry, internal medicine, pediatrics, cardiology, obstetrics & gynecology, neurology, and other fields, this technique is recommended.

An Apollo rural hospital in the Chittor region of Andhra Pradesh and the Apollo hospital in Chennai were connected through telemedicine under an ISRO-Apollo Hospitals Group trial project that began in 2001 in India. The INSAT satellites of ISRO supplied the required communication connections, and the hospitals of the Apollo group were outfitted with the requisite medical equipment.

Government organizations including the Ministry of Health and Family Welfare, as well as state governments, premier medical schools, private hospitals and companies in India have since implemented a number of efforts aimed at bringing high-quality healthcare to rural and distant areas of India.

They must deal with several difficult challenges, such as the availability and acceptable cost of technology and qualified personnel. They must also deal with concerns about data privacy and security. They must also cope with interruptions in power supply.

There are several benefits of using telemedicine. Telemedicine removes geographical obstacles to effective health care and makes it more readily available to those in rural and underserved locations. Moving a patient isn't always possible or desirable in critical care settings. An estimated 40% of Indian families say they borrowed money or sold assets to pay for medical bills. Paying for healthcare out of pocket is a huge financial strain for rural residents. They can get some help from telemedicine. teaching and learning via stories delivered over the internet Doctors in remote areas benefit from continuing medical education (CME).

4. AYUSHMAN BHARAT DIGITAL MISSION

Shri J. Satyanarayana is the head of the Committee formed to provide a framework for implementing the National Health Policy, 2017. The National Digital Health Blueprint, 2019 (NDHB) was prepared by this Committee, which laid out the building blocks and an action plan for implementing digital health in India thoroughly and holistically.

The National Digital Health Mission (NDHM) was launched by the Ministry of Health and Welfare (MoHFW) on August 15, 2020, in response to the NDHB. Six union territories participated in the NDHM's inception as a test project. A year after its introduction, the Ayushman Bharat Digital Mission (ABDM) has been rebranded and is now in effect throughout the country. Participation in the ABDM is currently optional.

By 2025, the ABDM hopes to have a national health information network, a federated health information architecture, and health information exchanges in place. If all goes according to plan, the healthcare system will be an interoperable one that allows patients' medical records to be accessed from both public and private facilities.

5. APPLICATIONS OF DIGITAL HEALTH

"Digital health" is an umbrella phrase that encompasses a wide variety of endeavors. Digital health refers to the management of one's health and well-being via the use of technology and communication. The following sections go through a few of the more important ones:

I. Telemedicine

Telecommunications technology is used to deliver healthcare through telemedicine. Even though telemedicine is not a distinct speciality, it distinguishes out in the utilization of diverse technology to provide typical healthcare services through the internet.

II. Point-of-Care Diagnostics

Point-of-care Diagnostics ("POCD") is an emerging trend in the medical device sector and comprises a wide variety of items that allow accurate diagnosis in resource restricted settings by patients themselves or healthcare practitioners. A variety of illnesses may be monitored and diagnosed at the same time thanks to this technology. Biosensors, portable x-rays, handheld ultrasounds, and POCD apps for smartphones have all recently been created.

III. m-Health

The provision of Digital Health services on a mobile platform is known as m-Health, or mobile health. With India having the world's second-largest smartphone market5, m-Health may be extremely profitable5. The nation is expected to have 664 million mobile internet users by the year 2036, therefore providing access to these apps on smartphones will not be a problem. More people may participate in the transformation because of the ease of Digital Health and the mobility of m-Health.

IV. Medical Virtual Assistants

In the world of m-health, medical virtual assistants, or "MVAs," are becoming more popular. Patients' requirements are met by virtual health assistants and chatbots, which act as a conduit between them and their doctors and take care of things like reminding them to get prescriptions filled, delivering health information, organizing visits, and keeping track of their medical data. In order to handle vast amounts of data, MVAs are often powered by AI-based software. This allows them to deliver personalized advise and perform specialized activities for each user. MVAs may also be used to conduct administrative functions in healthcare facilities, such as hospitals and clinics.

V. Electronic Health Records ("EHR")

Patients' medical records are stored in an electronic health record (EHR). Electronic health records alleviate some of the drawbacks of paper records, such as the risk of destruction and the difficulty in obtaining them. It doesn't matter where or when the information was obtained, EHRs may be accessed at any time. Even if a doctor is seeing a patient for the first time, he or she may see the patient's whole medical history thanks to EHRs. Patients and healthcare providers alike will benefit from this, since it reduces the need for unnecessary testing and facilitates secure information transmission.

VI. Big Data in Healthcare

Various Digital Health services are used to obtain raw data. EHRs produce enormous amounts of data that may be used in a variety of ways. The Internet of Things (IOT) is predicted to link 25 billion devices, and the data these connected devices are expected to produce will need to be analyzed. The sheer amount of data collected necessitates technologies like big data processing, which can subsequently be used by numerous businesses.

VII. Blockchain in Healthcare

Patients' medical records are stored in an electronic health record (EHR). Electronic health records alleviate some of the drawbacks of paper records, such as the risk of destruction and the difficulty in obtaining them. It doesn't matter where or when the information was gathered; EHRs may be accessible at any time from a central location. Even if a doctor is seeing a patient for the first time, he or she may see the patient's whole medical history thanks to EHRs. Patients and healthcare providers alike will benefit from this, since it reduces the need for unnecessary testing and facilitates secure information transmission.

VIII. e-Pharmacies

In the recent several years, India has seen an increase in e-pharmacies or internet pharmacies. An e-pharmacy, often known as an online pharmacy, is a pharmacy that accepts prescriptions via the internet and sends out orders through mail, courier, or delivery person. Pharmacies have adopted a variety of methods, including some that are entirely online and others that include a physical location. In the online pharmacy paradigm, pharmacists are able to reach a broader range of patients because of the lack of geographical boundaries. Even if the legal status of internet pharmacies is still a hazy issue, judicia interpretation may pave the way for legal acknowledgment of this development in the future.

IX. e-Learning in the Healthcare Sector

Continuous Medical Education (CME) is a statutory obligation for physicians and is important to stay up with the latest trends and discoveries in medicine. For physicians, e-Learning is a more convenient way to participate in these programs. As a bonus, you may access e-learning whenever and from anywhere you choose.

6. TELEHEALTH UTILIZATIONS IN INDIA

Data on hospital-specific super speciality teleconsultations was recently presented by the ISRO at its Telemedicine Users' Meet in Ahmedabad in May 2007. The data shows that in the previous five years, 30612 people sought advice from specialists in their respective superspecialties. The consultations are summarized in Table 1. With 18070 super speciality consultations in the previous five years, Narayana Hrudayalaya (NH Blore) a cardiac hospital in Bangalore tops the list, according to statistics. SRMC (Chennai), Apollo Hospitals (Chennai), and Amrita Institute of Medical Sciences (Cochin) all followed suit. NH Blore had the most tele-consultations per year, followed by SRMC, Apollo Hospitals, Chennai (Apollo Ch), and so on, according to the statistics.

Cardiology, Cardiac Surgery, Neurosciences, and other fields were consulted by Narayana Hrudayalaya. Their primary focus is on remote monitoring of the heart using tele-cardiology techniques. Apollo Chennai, on the other hand, does not have any hard statistics on the number of super speciality consultations. Pediatrics has been consulted in 1220 instances from the beginning, followed by general surgery. Sri Ram Chandra Medical College did not have a clear-cut difference between the several fields it offered. Twenty-one departments of Amrita Institute of Medical Sciences were contacted.

Chandigarh's Post Graduate Institute of Medical Education and Research (PGIMER) saw 1,106 patients. Obstetrics and Gynecology, Pediatrics, Pulmonary Medicine, and Orthopedics rounded up the top five most often consulted fields. Besides the Sanjay Gandhi Postgraduate Institute of Medical Sciences (SGPGI,Luck), Tata Memorial Hospital (TMC Mumbai), a cancer hospital in Mumbai, and the All India Institute of Medical Sciences (AIIMS), New Delhi, three other government hospitals had the most tele-consultations: 754 at SGPGI,Luck and 550 at TMC Mumbai.

Table 1 Super specialty consultations

Sl. No.	Duration* (1)	2002-2007~ (2)	# Patients (3)~	Patients/month (rounded) (4)~	Patients/annum (rounded) (5)~
1.	5.5 years	NH Bl're	18070	274	3285
2.	4.5 years	SRMC	3300	61	733
3.	5 years	AIMS	1270	24	254
4.	6years	ApolloCh	3932	55	655
5.	1.5 years	Fortis	1132	63	755
6.	5 years	SGRH	48	1	10
7.	3 years	TMC Mumbai	550	15	183
8.	2years	PGIMER, CHA	1106	46	553
9.	4 years	SGPGI, Luck	754	16	189
10.	5 years	AIIMS	450	8	90

Source: Proceedings of the Telemedicine Users Meet 2007, ISRO.

~ Data published on the Proceedings of the Telemedicine Users Meet 2007 [(2), (3) and (4)]

* Extrapolated from (3) and (4)

Specialty Consultation per annum

Figure 1 depicts the number of tele-consultations done by different institutions in the United States each year. According to these numbers, hospitals who began using Telehealth modalities sooner have seen a higher number of consultations. Fortis (755 beds) and PGIMER (553 beds) in Chandigarh are the only two exceptions to this rule. Over the course of two years, both institutions consulted more than 1,000 patients.
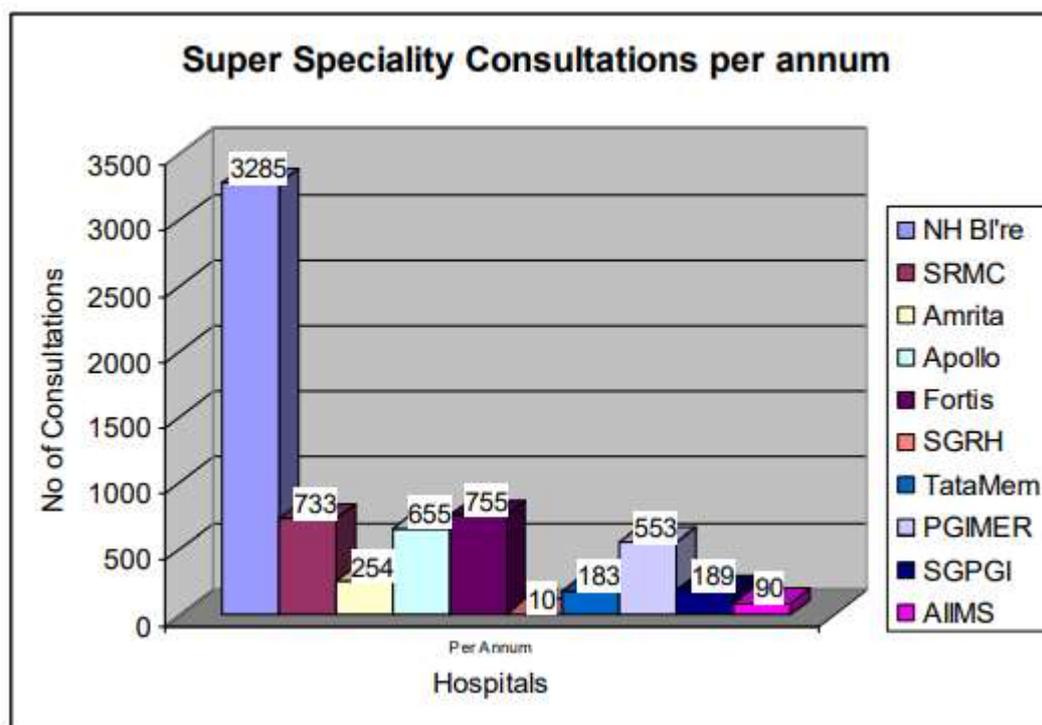

Figure 1 Super Specialty Consultation per annum

Source: Proceedings of the Telemedicine Users Meet 2007, ISRO.

Forty super speciality hospitals are linked to the network, as per the proceedings. Only 10 hospitals have data available. Both private-run and government-run hospitals are shown in Figure 2. 3285 to 755 private and 55 to 755 government consultations are made in private hospitals, respectively. Hospitals in the private sector are either owned by corporations or run by non-profit organizations. The PGIMER, one of the government-run institutions, has consulted with CHA on an annual average of 553 cases. In comparison to private hospitals, it's been doing better than most of them. Only 10 patients are sent to the Sir Ganga Ram Hospital (SGRH) in New Delhi each year. It's an independent, non-profit hospital.

It's obvious from the data above that the number of tele-consultations is the same in private and public hospitals. Some government hospitals did better than private ones. Only when it comes to specialty-specific consults, private and government hospitals are equal. Oncology and Cardiology are two examples of successful specialized hospitals. This displays the number of patients sent to various disciplines in other hospitals when there are less of these specialists available. Additionally, two eye hospitals have excelled in their respective fields. According to the aggregated numbers, they weren't included.

According to the proceedings, there are just a few reasons why telehealth services are underutilized. 'Here are a few of them.

1. Non availability of qualified personnel

2. Increase in workload to physicians

3. There was no mention of a monetary gain in online CMEs in the continuing medical education.

4. System failures

5. No maintenance support after installation

7. CONCLUSION

It's true that telemedicine isn't a replacement for the conventional healthcare system, but it may assist bridge the gap between urban and rural parts of India when it comes to access and quality of healthcare. With the use of telemedicine, India's disadvantaged people may now get essential healthcare treatments at a low cost. When compared to other developing nations, Telehealth in India is functioning well. To put it another way, India is leading the way when it comes to information and communication technologies and space technology. When compared to other developing nations, Telehealth in India is functioning well. With the use of Space Technology and Information and Communication Technology, India has become a top performer in the field of Telehealth. Alvin Toffler 97 predicted a "information era" in 1997, which is a sort of industrialization in which knowledge, skill, and technology are vital to the development and success of every sector. The digital world of today is filled with a variety of technologies that help to progress the global community. Although this condition is good for mankind as a whole because of the progress of new drugs and treatments in the health sector that enhance our quality of life and lengthen our lifespan among other things.

8. REFERENCE

1. Bokolo Anthony Jnr. Use of Telemedicine and Virtual Care for Remote Treatment in Response to COVID-19 Pandemic. J Med Syst 44, 132 (2020). https://doi.org/10.1007/s10916-020-01596-5
2. Vinoth G. Chellaiyan et.al "Telemedicine in India: Where do we stand?" doi: 10.4103/jfmpc.jfmpc_264_19
3. Abid Haleem et.al "Telemedicine for healthcare: Capabilities, features, barriers, and applications" Volume 2, 2021, 100117
4. Surya Bali "Barriers to Development of Telemedicine in Developing Countries" DOI: 10.5772/intechopen.81723
5. Y. Xue, H. Liang, V. Mbarika, R. Hauser, P. Schwager, M.K. Getahun Investigating the resistance to telemedicine in Ethiopia Int. J. Med. Inf., 84 (8) (2015 Aug 1), pp. 537-547
6. P. De Toledo, S. Jiménez, F. del Pozo, J. Roca, A. Alonso, C. Hernandez Telemedicine experience for chronic care in COPD IEEE Trans. Inf. Technol. Biomed., 10 (3) (2006 Jul 5), pp. 567-573
7. F. Acheampong, V. Vimarlund Business models for telemedicine services: a literature review Health Systems, 4 (3) (2015 Nov 1), pp. 189-203
8. Mehta KG, Chavda P. Telemedicine: A boon and the promise to rural India. J Rev Prog. 2013;1:1–3.
9. Bhowmik D, Duraivel S, Singh RK, Kumar KPS. Telemedicine- an innovating healthcare system in India. Pharma Innov. 2013;2:1–20.
10. Kumar A, Ahmad S. A review study on utilization of telemedicine and e-Health services in public health. Asian Pac J Health Sci. 2015;2:60–8.
11. A. Loutfi, G. Akner, and P. Dahl, An android based monitoring and alarm system for patients with chronic obtrusive disease [M.S. thesis], Department of Technology at Orebro University, 2011.
12. V. K. Sambaraju, Design of a Wireless Cardiogram System for Acute and Long-Term Health Care Monitoring, ProQuest, 2011.
13. J. Bai, Y. Zhang, D. Shen et al., "A portable ECG and blood pressure telemonitoring system," IEEE Engineering in Medicine and Biology Magazine, vol. 18, no. 4, pp. 63–70, 1999.
14. K. Hung and Y.-T. Zhang, "Implementation of a WAP-based telemedicine system for patient monitoring," IEEE Transactions on Information Technology in Biomedicine, vol. 7, no. 2, pp. 101–107, 2003.