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Review Article

A Review: Telemedicine in India Challenges and Application

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ABSTRACT

Telemedicine has recently gained a lot of traction as a result of the growing deployment and development of digital technology. It should be considered for inclusion in national and international recommendations when they are updated. Due to strict social separation and a lack of viable therapies during the COVID-19 pandemic, telemedicine has proven to be the safest interactive mechanism between patients, both infected and uninfected and professionals. A few possible evidence based scenarios for telemedicine application have been proposed. As a result of the expanding deployment and development of digital technology, telemedicine has recently received a lot of attention. When national and international recommendations are changed, it should be taken into account for inclusion. Telemedicine has shown to be the safest interactive medium between patients, both infected and uninfected and professionals during the COVID-19 pandemic due to severe social separation and a lack of viable therapies.

Keywords: Telemedicine; Challenges; Technology; Application; Indian scenario

INTRODUCTION

When participants are separated by a significant distance, telemedicine is the use of electronic information and communication technology to offer and support healthcare.

"Tele" comes from a Greek word that means "distance," and "mederi" comes from a Latin word that means "to heal." Telemedicine has been dubbed "healing by wire" by time magazine. Telemedicine, formerly thought to be "futuristic" and "experimental," is now a reality and here to stay. In patient care, education, research, administration and public health, telemedicine has a wide range of uses.

People in rural and distant places around the world struggle to get timely, high-quality specialty medical care. Residents of these places frequently have poor access to speciality healthcare, owing to the fact that specialist physicians are more likely to be found in densely populated urban areas. Telemedicine offers the ability to overcome this gap and make healthcare more accessible in these rural locations.

LITERATURE REVIEW

History of telemedicine

While the recent surge in interest in telemedicine makes it appear to be a relatively new application of telecommunications technology, the truth is that telemedicine has been used in some form or another for more than thirty years. The National Aeronautics and Space Administration (NASA) was a key player in the early stages of telemedicine research.

When humans first flew into space in the early 1960's, NASA began working on telemedicine. During missions, physiological parameters were relayed from both the spacecraft and the space suits [1].

The national library of medicine's lister hill national center for biomedical communication chose 26 sites in Alaska in 1971 to test if dependable communication could improve village healthcare. It made use of ATS-1, the first of NASA's applied technology satellites, which was launched in 1966. The study's main goal was to see if satellite video consultation may help enhance the quality of rural healthcare in Alaska. The memorial University of Newfoundland's telemedicine centre has been working on establishing interactive audio networks for

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educational programmes and medical data delivery since 1977. In 1984, Australia's north-west telemedicine project was established to test a government satellite communications network (the Q-Network) [2].

Concept: Telemedicine-telemedicine, often known as telehealth or e-medicine, is the remote delivery of healthcare services such as exams and consultations over telecommunications infrastructure. Doctors may screen, diagnose and treat patients without having to see them in person because to telemedicine. Patients can communicate with doctors from the comfort of their own homes utilising personal technology.

Telehealth: The use of electronic information and telecommunications technology to assist long-distance clinical healthcare, patient and professional health related education and training, public health and health administration is known as telehealth.

Telemedicine specialty center: A venue where you can find an expert. He can communicate with the patient from afar, as well as observe and track his reports and progress.

Telemedicine consulting center: In a telemedicine consulting centre, equipment for scanning/converting, transformation and communication of the patient's medical information may be available.

System of telemedicine: The telemedicine system consists of a hardware, software and communication channel interface that will eventually connect two geographical locations to exchange information and enable teleconsultation.

The gear consists of a computer, printer, scanner, videoconferencing equipment and other items. The software enables the collecting of patient information (images, reports, films etc.). The communication channel is the medium through which two locations can communicate with one another.

Benefits of telemedicine

- Easy access to off-the-beaten-path locations.
- In peripheral health settings, telemedicine can drastically cut the time and expense of patient transportation.
- Home care and ambulatory monitoring are both monitored.
- Improves communication between health practitioners who are separated by a large geographical distance.
- When a patient cannot be transferred, critical care monitoring is used.
- Clinical research and continuing medical education.
- A public awareness tool.
- A disaster-prevention tool.
- Second thoughts and a variety of interpretations.
- Once connectivity has been established, the greatest hope for telemedicine technology is that it will be able to offer knowledge to medical procedures.
- Telemedicine-assisted surgery with hand robots.
- Surveillance of diseases and programme evaluation.
- It allows for standardisation and equity in healthcare provision inside particular countries as well as across regions and continents.

DISCUSSION

Technology in telemedicine services

The majority of telemedicine applications in use today are made up of two types of technologies. The first method, known as store and forward, is used to move digital photographs from one place to another. A digital image is captured with a digital camera stored and then delivered (forwarded) to another location by a computer. This is often utilised in non-emergency situations if a diagnostic or consultation may be completed and returned within the following 24-48 hours. A few examples include teleradiology, telepathology and teledermatology [3].

When a 'face-to-face' consultation is required, the second extensively utilised technology, two-way Interactive Television (IATV), is used. At the originating site, the patient and their provider or more typically, a nurse practitioner or a telemedicine coordinator (or any mix of the three), are present. The referral site, which is usually an urban medical facility, is where the specialist is located. Both locations include video conferencing equipment, allowing for a 'real time' consultation. Psychiatry, internal medicine, rehabilitation, cardiology, paediatrics, obstetrics and gynaecology and neurology are among the medical disciplines that have been shown to be amenable to this type of consultation [4].

Telecommunication technology

'What is bandwidth?' is the first of many difficult questions that arise when developing a telemedicine network. Bandwidth is the capacity of a telecommunication media that determines how rapidly bits can be transferred down the channels. For a given degree of system performance, bandwidth is proportional to the data complexity [5]. Currently, the following technologies are in use:

Integrated Services Digital Network (ISDN): ISDN is a digital connection to the telecommunication carrier that is dialled up (not dedicated, but used on a call-by-call basis). An ISDN line may transmit data at a pace roughly five times faster than analogue modems over POTS can (Plain Old Telephone Service).

This is the backbone of today's digital service in the United States, which carries voice and data digitally at 1.554 megabits per second to end users (usually businesses) (Mbps). It can carry analogue and digital phone, data and video signals and it can even be set up to provide ISDN service.

Plain Old Telephone Service (POTS): POTS is the most frequently used telecommunication technology in the world, transmitting data at up to 56 kilobits per second (kbps). Audio conferencing, store and forward communication, internet and low bandwidth videophone conferencing can all be done over POTS.

Internet: The internet has a significant impact on how some types of treatment are delivered to patients. In an internet health care magazine study of 1,000 Chief Intelligence Officers (CIOs), 65 percent stated their business had a web presence, with another 24 percent saying they were working on one. Many customers now have access to online patient scheduling, health

education, lab test review and even e-mail consultations thanks to the growing number of e-health services on the internet [6].

Telemedicine's impact on public health care

It has the potential to provide fresh insights into the regional distribution and gradients of illness prevalence and incidence, as well as vital information for population health assessment [7]. It also provides useful information about risky populations based on risk factor profiles. It aids in the identification and differentiation of risk factors in the population. It also aids in interventional planning, as well as the evaluation and success of various interventional techniques. It has the potential to be extremely useful in predicting epidemics. It is a critical tool for disease surveillance in real time, both locally and worldwide. GIS provides the foundational architecture and analytical tools for doing spatial-temporal modelling of climate, environment and disease transmission, which aids in the study of vector-borne illness transmission. In this case, remote sensing techniques have lately been applied.

Traditional disease surveillance and reporting methods differ from GIS-based methods for gathering, accessing, evaluating and maintaining data. It allows for the aggregation and integration of heterogeneous data from many sources, allowing for the development of public health programmes and policy decisions to be guided by it.

Disease prevention and interactive health communication

Individuals and population organizations can be informed, influenced and motivated about health, health related concerns and the adoption of healthy lifestyles through information technology and telemedicine. Primary, intermediate and tertiary health promotion and disease prevention agendas can all benefit from the varied methodologies and applications [8].

It may communicate with individuals as well as the entire population. It has the potential to provide quick access to those who live in rural places. It allows for well-informed decision making. It also makes the process of making health decisions and communicating with persons about the prevention, diagnosis and management of a health condition easier. As a result, users are exposed to a wider range of options. It has the potential to help the community promote and sustain healthy habits.

It can also aid in information sharing and emotional support among peers. Individuals with specific health illnesses, requirements or issues, for example, can contact with one another, share information and provide/receive emotional support using the internet applications. It encourages people to exercise self-care and domiciliary care. Self-management of health problems, which will enhance existing health care facilities, can assist many people living in distant places. It has the potential to be a critical tool for evaluating and monitoring healthcare services.

Telemedicine in India

India is a huge country, having a population of around 121 million people. As a result of this, equal distribution of healthcare resources has repeatedly shown to be a major priority in public health management. The recent tendency of concentrating healthcare facilities in cities and towns (including 75 percent of the population of doctors) away from rural India, where 68.84 percent of the population lives, adds to this.

In 2001, the Indian Space Research Organization (ISRO) launched a telemedicine pilot project in India, connecting Chennai's Apollo hospital with the Apollo rural hospital in Aragonda village in Andhra Pradesh's Chittoor district. ISRO, the Department of Information Technology (DIT), the ministry of external affairs, the ministry of health and family welfare and state governments all took steps to help India establish telemedicine services.

Other significant initiatives taken by the government include the creation of standardised telemedicine practise standards by the department of information technology and the development of a national telemedicine task force by the health ministry in 2005. The external affairs ministry has also taken on international projects like the pan African eNetwork project and the South Asian Association for Regional Cooperation (SAARC) telemedicine network projects, strategically positioning Indian telemedicine in the global landscape.

India's current situation

The world health organization recommended a doctor to population ratio of 1:1000; however India's current doctor to population ratio is merely 0.62:1000. Because new medical training is time consuming and costly, the doctor to patient ratio is likely to stay low for some time. The active telemedicine services in various parts of the country help to make up for this shortfall.

The ministry of health and family welfare and the department of information technology are jointly responsible for telemedicine services in the country. The telemedicine division of the ministry of health and family welfare of the government of India has established a national telemedicine portal to carry out a greenfield project on e-health by establishing a National Medical College Network (NMCN) for interconnecting medical colleges across the country for the purpose of e-Education and a national rural telemedicine network for e-healthcare delivery.

The National Digital Health Authority of India (NDHAI)/ National e-Health Authority (NeHA) is being established as part of the National Health Portal's (NHP) e-health wing with the goal of achieving high-quality health services for all Indians through the cost-effective and secure use of ICTs in health and health related fields. MoHFW created a set of Electronic Health Records (EHR) standards in 2013 and a revised version of the same in 2016 to ensure safe data transmission during telemedicine procedures. In India, telemedicine is being used in the disciplines of traditional medicine as well. The national rural AYUSH telemedicine network aims to use telemedicine to

spread the benefits of traditional treatment approaches to a greater audience.

Arogyasree is another internet based mobile telemedicine conglomerate that connects hospitals, medical professionals and rural mobile units/clinics. The project is the brainchild of the Indian Council of Medical Research (ICMR). They worked with a group of scientists from the University of Karlsruhe in Germany on the design of an ECG jacket that may be used to continuously monitor a patient's ECG without requiring hospitalization.

Challenges

Doctors' perspectives: Doctors are unsure about e-medicine and are unfamiliar with it.

Patients' concern and unfamiliarity with e-Medicine: Patients lack faith in the outcome of e-Medicine.

Financial unavailability: Telemedicine is sometimes financially impracticable due to high technology and communication costs.

Lack of basic necessities: Nearly 40 percent of India's population lives in poverty. Transportation, electricity, telecommunications, safe drinking water, primary health care and other basic services are all lacking. When a person has nothing to change, no technical improvement can help. Literacy rate and language diversity: Barely 65.38 percent of India's population is literate, with only 2% proficient in English.

Technical limitations: e-Medicine, which is supported by a variety of software and hardware, is still in its infancy. Advanced biological sensors and better bandwidth support are required for proper diagnostics and data pacing.

Aspect of quality: "Quality is essential," and everyone wants it, yet it can occasionally cause issues. In the case of healthcare, there is no competent regulatory authority to set rules and drive organisations to follow them-it is entirely up to the organisations to decide how they will handle it.

Government assistance: Both the government and private businesses have restrictions. Any technology in its early stages necessitates attention and support. Only the government has the resources and authority to assist it in surviving and expanding. The government has taken no such initiative.

Application of telemedicine

Healthcare delivery

- School-based health centers helps manage chronic conditions like bronchial asthma, diabetes and obesity. Telemedicine allows a school nurse, remote access to specialist medical opinion.
- Correctional facilities cater to the healthcare needs of the inmates without the expense and dangers of inmate transportation or the need for a specialist doctor to enter.
- Mobile health clinics provides quick access to a remote physician or medical specialist.
- Shipping and transportation helps avoid evacuations and unscheduled diversions during a medical emergency.

Delivery of healthcare

- School-based health centres assists with the management of chronic illnesses such as bronchial asthma, diabetes and obesity. Telemedicine allows a school nurse to get a specialised medical opinion from a distance.
- Correctional facilities provide healthcare to convicts without incurring the costs and risks of inmate transportation or requiring a specialty doctor to enter.
- Mobile health clinics provides immediate access to a physician or medical professional who is located elsewhere.
- During a medical emergency, shipping and transportation can help avoid evacuations and unforeseen diversions.
- On site medical management and triage assistance are provided by industrial health.

Management of healthcare

- Tele-health care refers to the use of Information and Communication Technologies (ICTs) in the prevention and promotion of health; it is further separated into teleconsultation and tele-follow-up.
- Tele-home health care using a Computer Telephone Integrated (CTI) system, monitor patients from a central station (remote patient monitoring).
- Tele-ophthalmology, tele-psychiatry, tele-cardiology and tele-surgery are examples of specialties.
- Tele-radiology and tele-endoscopy are examples of diagnostic services.

Disease diagnostic screening

- The Chunampet Rural Diabetes Prevention Project, for example, is a diabetic screening project run by MDRF.
- Aravind hospitals conducted an ophthalmology screening in Andipatti village.

Disaster management

- In a disaster-stricken area when all other modes of connectivity have been disrupted, a mobile and portable telemedicine system with satellite connectivity and tailored telemedicine software is suitable.
- Examples include NASA telemedicine services supplied during the 1985 earthquake in Mexico City and the 1988 earthquake in Soviet Armenia.
- During the 2004 Tsunami crisis, Amrita hospital provided telemedicine services.

Role in family medicine

Telemedicine is already moving health care delivery from hospitals and clinics into homes, both nationally and worldwide, thanks to contemporary Information and Communication Technologies (ICTs). With the help of a CTI system that allows for 24 hour vitals monitoring, it allows for remote patient monitoring. The CTI system allows family doctors to keep a close eye on chronically unwell patients and receive live vitals alerts as needed. Telemedicine also provides a family physician with remote access to a specialist medical opinion for cross consultation as necessary. A good example would be consulting a cardiologist to validate a suspect ECG or

a nutritionist to develop an appropriate diet plan for an elderly bedridden patient with several co-morbidities.

Tele-health is different from telemedicine in that it uses telecommunications and virtual technology to give health care outside of typical health care settings. Virtual home health care, for example, allows chronically ill or elderly patients to get guidance in specific treatments while remaining at home. Video conferencing, store and forward, m-health (mobile health) and patient monitoring are all examples of tele-health services.

Despite having so many promising characteristics for supporting family physicians, telemedicine has yet to attain its full potential in the practice of family medicine. The key constraint is a lack of relevant scientific literature demonstrating the applicability and cost effectiveness of its use in family practice.

Role in public health

Telemedicine technology allows clinicians and patients to be nearly anywhere, which is one of the most important components in providing quality healthcare to the poor. With the development of telemedicine, providing healthcare to rural locations is no longer a challenge. The lack of a major centre for practising telemedicine services in many remote places created an initial difficulty for the program's start, but that was overcome with the launch of mobile telemedicine units with satellite connectivity. Telemedicine services can now be made available to everybody, regardless of their location, social level or gender.

CONCLUSION

Telemedicine is considered to be the remote diagnosis and treatment of patients by means of telecommunications technology, thereby providing substantial healthcare to low income regions. Earliest published record of telemedicine is in the first half if the 20th century when ECG was transmitted over telephone lines. From then to today, telemedicine has come a long way in terms of both healthcare delivery and technology. A major role in this was played by NASA and ISRO. The setting up of the National Telemedicine Taskforce by the Health Ministry of India, in 2005, paved way for the success of various projects like the ICMR-AROGYASREE, NeHA and VRCs. Telemedicine also helps family physicians by giving them easy acess to speciality doctors and helping them in close monitoring of patients. Different types of telemedicine services like store and forward, real-time and remote or self-monitoring provides various educational, healthcare delivery and management, disease screening and disaster management services all over the globe. Even though telemedicine cannot be a solution to all the problems, it can surely help decrease the burden of the healthcare system to a large extent.

REFERENCES

1. Yellowlees P, McCoy WT. Telemedicine. A health care system to help Australians. Med J Aust. 1993;159(7):437-438.
2. Houtchens BA, Allen A, Clemmer TP, Lindberg DA, Pedersen S. Telemedicine protocols and standards: Development and implementation. J Med Syst. 1995;19:93-119.
3. Balas EA, Jaffery F, Pinciroli F. Patient care from a distance: Analysis of evidence. Annu Meet Int Soc Technol Assess Health Care. 1996;12:17.
4. Grigsby J, Schlenker RE, Kaehny MM, Shaughnessy PW, Sandberg EJ. Analytic framework for evaluation of telemedicine. Telemed J. 1995;1(1):31-39.
5. Mezrich RS, DeMarco JK, Negin S, Keller I, Schonfeld S, Safer J, et al. Radiology on the information superhighway. Radiology. 1995;195(1):73-81.
6. Kopp S, Schuchman R, Stretcher V, Gueye M, Ledlow J, Philip T. Telemedicine. Telemedicine J E-Health. 2002;8:18.
7. Mishra SK, Kapoor L, Singh IP. Telemedicine in India: Current scenario and the future. Telemed J E Health. 2009;15(6):568-575.
8. Chellaiyan VG, Nirupama AY, Taneja N. Telemedicine in India: Where do we stand? J Family Med Prim Care. 2019;8(6):1872-1876.