TELEMEDICINE- A BOOM IN HEALTHCARE SYSTEM

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Abstract

Telemedicine is often attributed for its capability to address problems in health care, including limited accessibility, cost inflation, and uneven quality.

Telemedicine is the use of advanced telecommunication technologies for the purposes of making diagnosis, conducting research, transferring patient data, improving disease management and treatment in remote areas**.** It significantly improves the quality of healthcare by increasing accessibility and efficiency by decreasing the need to travel, providing clinical support, overcoming geographic barriers, offering various types of communication devices and improving outcomes. As we're seeing an interesting convergence of technology, medicine, social issues and human progress, telemedicine will become the core methodology of healthcare delivery in the future. That is where we are going to get the efficiencies and need to provide affordable care.

Keywords: Telemedicines, Resurgance, Intransigient, Acquisition, Continuum.

Introduction

Telemedicine is a complex innovation bundle that is technical, organizational and social innovation. Initially telemedicine was considered "futuristic" and "experimental," but today it is a reality. It has a variety of applications in patient care, education, research, administration and public health.[1] The World Health Organization (WHO) refers telemedicine as "healing from a distance". It comprises the use of telecommunication technology and information technologies to provide remote clinical services to patients. Physicians use telemedicine for sending digital images, video consultations, and remote medical diagnosis. Telemedicine is simply defined as technology that allows patients to communicate with a healthcare provider

using technology, and not visiting a doctor's office or hospital.[2] The main characteristics of telemedicine network include scalability, transparency, fault tolerance, geographic coverage, security, etc. which enable the specialist doctor and the patient who are separated by thousands of kilometres to see visually and talk to each other. It also allows the doctor to access the physical and mental state of the patient and suggest treatment.[3] The Telemedicine system comprises of an interface between hardware, software and a communication channel which can eventually link the two geographical locations to exchange information and permit teleconsultancy in two locations. The hardware consists of a computer, printer, scanner, videoconferencing equipment etc and the software enables the procurement of patient information (images, reports, films etc.). The communication channel enables the connectivity where in two locations can connect to each other.[4]

History of Telemedicine

Telemedicine is not a new practice, the concept of telemedicine is dated back to the 19th century. The history of telemedicine will disclose how we got to where we are today.

Telemedicine in the 19th Century

The creation of telemedicine initiated with the foundation of the telecommunications infrastructure, which included the telegraph, telephone, and radio. During the civil war Casualties and injuries were reported using the telegraph in addition to ordering of medical supplies and consultations. This is one of the earliest adoptions of telemedicine technology.

In 1879, a Lancet report showed how using the telephone can reduce the number of unnecessary office visits. This was the beginning of patient care transformation.

Telemedicine in the 20th Century

In 1922, teledactyl was highlighted in a science magazine by Dr. Hugo Gernsback. He predicted that this sensory feedback device will allow the physicians to see their patients through a television screen and touch them from miles away with the help of robot arms.

In Pennsylvania by 1948 the first radiologic images were sent with the help of telephone between two medical staff situated at two different health centers which were 24 miles apart. In 1959, physicians at the University of Nebraska conveyed neurological examinations across campus to medical students with two-way interactive television. After Five years, a closed-circuit television link was built which allowed physicians to provide psychiatric consultations 112 miles away at Norfolk State Hospital.

Telemedicine Today

Most people today use basic telemedicine devices like mobile phones and computers. With better accessibility, people in rural and urban areas can connect with a provider easily. With the help of home use medical devices it is possible for caregivers to monitor things from vitals to glucose levels. Physicians can collect essential medical information and make a diagnosis without patients entering in a doctors office.

By 2020, telemedicine is expected to be a $35 billion industry and be an essential part of modern healthcare delivery. The history of telemedicine describes that we've come so far from where we started, and yet have a long way to go. [5]

Types of telemedicine [2][6]

There are three common types of telemedicine:

Interactive medicine: It is also termed as "live telemedicine," where physicians and patients communicate in real time. The basic goal of telemedicine software is to see and talk to patients from a distance. This offers a virtual alternative to the in person doctors visit and medical treatment with the help of simple compatible devices, internet connection, microphone and a webcam.

Remote patient monitoring: It permits the caregivers to monitor patients who use mobile medical equipment to gather data like blood pressure, blood sugar levels, etc. This technique makes it easy to monitor warning signs and intervene patients who are

at health risk or recovering from surgery. It provides right health tracking tools in patients home

Store and forward: it allows the providers to share a patient's health information with other healthcare professionals. The patients private data can be shared online in a secure way. It refers to the fact that consulting specialist, patient and the primary doctor have no need to communicate at the same time. This technique works best for interprofessional medical services where it is necessary for the provider to outsource diagnosis to a specialist. Also it provides faster diagnosis, for patients in underserved settings who may not have the necessary specialist.

EQUIPMENTS THAT CAN BE USED :

The basic tools needed for examining the patient:

- **Remote vital monitoring**: This device takes a patient's vitals and sends the results straight to the device. If any patient is at risk of serious problems then, they can wear these devices continuously.
- **Virtual stethoscopes:** It records audio from the patient's end and then transmit it to patient's device. Audio can be recorded from any area to be examined like heart, lungs, or digestive system.
- **Wireless scales:** it provides an accurate reading of a patient's current weight which makes it easier to prescribe medication and treatments, without professionals seeing the patient physically.
- **Thermometers:** a thermometer that can record and display their temperature on a screen and can send the examiner this data multiple times a day.
- **Digital otoscopes:** It can livestream video and images to doctor and record images for future viewing allowing the patient to examine their ear any time and send the image so that doctor can look at it when it's convenient.
- **Pulse oximeters.** It measures patients oxygen level. It is important in COVID-19 patients as they may have low oxygen level.
- **High-quality cameras for specialty practices:** they are used to diagnose medical issues accurately. Mostly used by specialists like dermatologist and radiologist who need higher resolution images and videos for diagnosis.

- **HIPAA-compliant software.** Using the software such as JotForm's telemedicine toolkit allows patients to upload files, images, or videos. It also allows healthcare professionals to securely collect patient signatures, access information on any device, and integrate with more than 100 healthcare apps. [7]

Applications

There are few limitations of how telemedicine can be used. Following are some examples of how it is being used today.

Follow-up visits

The use of health software for routine follow-up visits is not only more efficient for providers and patients, but it also elevates the likelihood of follow-up, lowering the missed appointments and improves patient outcomes.

Remote chronic disease management

The rapidly increasing rate of chronic disease is a major challenge for health system. the use of telemedicine software makes it easy and cheap for patients to maintain control over their health.

Remote post-hospitalization care

One telehealth program for patients with congestive heart failure lowered 30-day hospital readmissions by 73% and 6-month readmissions by 50%.

Preventative care support

Weight loss and smoking cessation are the keys to reduce heart disease. Telemedicine can be an important tool in connecting both the providers and the patients to make sure they get the support they need to be successful.

School based telehealth

If children become ill at school then they visit a school nurse or are picked up by their parents and taken to an health care center. Some innovative districts have collaberated with doctors to conduct remote visits from the school so that the provider can check the urgency of the case and provide instructions to parents.

Assisted living center support

Telemedicine software are proven to be useful in keeping residence of assisted living facilities out of the hospital. Problems often occur at night or on weekends, which makes hospitalization the only option even if the problem is less complicated. With the use of telemedicine, on-call doctors can have a remote visit and assess if hospitalization is necessary.[8]

Interactive health communication and disease prevention

Information technology and telemedicine can be used to inform, influence and motivate individuals on health, health-related issues and acquiring a healthy lifestyle.[9] An untreated kala-azar and post kala-azar dermal leishmaniasis patient makes up the major reservoir for continuing transmission of VL.Therefore, timely, effective diagnosis and drug treatment are essential not only to cure the individual patients, but also to decrease the time from onset of illness to diagnosis. Telehealth through satellites can play a role in the diagnosis and treatment of urgent patients in the field. However, in VL treatment, telehealth may simplify the health decision-making process or communication between healthcare providers and individuals on prevention, diagnosis, or management of a health condition . To seek the opinion of a specialist using tele-communication, doctors can connect to the specialist's personnel computer from within the telehealth software. The rapid access to a wider range of specialists and medical procedures, to manage overall medical systems and patients care through seamless delivery of service by satellites can provide chances for both patients and medical staff to various urgent medical care treatments.[10]

ISRO CASE STUDY

Telemedicine is one of the special applications of Space Technology for societal benefit. ISRO Telemedicine programme initiated in 2001 and has been connecting

remote/rural/medical college hospitals and Mobile Units to major specialty hospitals in cities and towns with the help of Indian satellites. ISRO Telemedicine network surrounds various states/regions like Jammu & Kashmir, Ladakh, Andaman & Nicobar Islands, Lakshadweep Islands, North Eastern States and other mainland states. The tribal districts of Kerala, Karnataka, Chhattisgarh, Punjab, West Bengal, Orissa, Andhra Pradesh, Maharashtra, Jharkhand and Rajasthan are also covered under Telemedicine Programme.

Fig.1: Extension of healthcare through telemedicine mobile van during Koshi river floods in Bihar.

At present, the Telemedicine network of ISRO covers about 384 hospitals with 60 specialty hospitals connected to 306 remote/rural/district/medical college hospitals and 18 Mobile Telemedicine units. The Mobile Telemedicine units cover different areas of Ophthalmology, Cardiology, Radiology, Diabetology, Mammography, General medicine, Women and Child healthcare.

While DOS/ISRO issues Telemedicine systems software, hardware ,communication equipment as well as satellite bandwidth, state governments and the speciality hospitals have to assign funds for their part of infrastructure, manpower and facility support. The technology development, standards and cost effective systems have been evolved in association with various state governments, NGOs, specialty hospitals and industry. DOS collabrates with state governments and specialty hospitals for bringing an understanding between the parties through MOU.

The recent activities under Telemedicine Programme included migration and operationalisation of the nodes which were affected due to non-availability of EDUSAT (GSAT-3). Most of 190 nodes operating on EDUSAT were migrated to

GSAT-12 satellite. Around 139 nodes are now operational on INSAT-3A and the remaining on INSAT-3C and INSAT-4A satellites. ISRO is in the courses of bringing the annual maintenance support for the Telemedicine systems to confirm the continuity of service.

A Telemedicine monitoring node is constituted in DECU, Ahmedabad which is used for evaluating and supporting users for minor troubleshooting, etc.

A Telemedicine Users' Meet was held at DECU, Ahmedabad to check the utilization and the future plans of the states/hospitals/institutions regarding the telemedicine nodes.[11]

Advantages of telemedicine:

There are many advantages of telemedicine in healthcare system

More convenient, accessible care for patients

More accessible and convenient health care for patients is the driving force behind telemedicine field. It was developed in U.S. to address care shortages, in remote rural areas. This technique is used around the world, whether to provide basic healthcare in third world countries or allow an elderly patient with mobility issue to see the doctor. Telemedicine has the power to break down typical geographical barriers to care access, and make the healthcare delivery model more convenient to patients.

Extends access to consult from specialist

Small hospitals which are not having proper radiology specialist can outsource evaluation of X rays using telemedicine.

Increase patient engagement

it engages patients by allowing them to connect with doctor more frequently, more questions can be asked and answered and a strong doctor patient relationship can be maintained.

Better quality patient care

Telemedicine makes it simpler for providers to follow up with patients and make sure things go well even if they are using a extensive remote patient monitoring system to

assess patients heart, or answering medication question through video chat after discharge.

Ensures safety of private information

Medicine requires no special outlay except a web camera and a secure patient portal that connects the doctor to a secured electronic medical record database online. This ensures the safety of the private information that is discussed during a telemedicine call, also while providing the necessary medical records. The online patient record has the potential to make the prescription more reliable and accurate.[12]

Telemedicine reduces healthcare costs

Telemedicine elevates the efficiency of care delivery, whereas it minimizes the expenses of caring for patients or transporting to another location, and can even keep patients out of the hospital. In fact, one study showed that telemedicine care had 19% savings over inpatient care cost. Telemedicine is a regular healthcare service. it should be billable to your health care insurance without issue.[13,14]

Challenges[15,16,17]

- **Perspective of medical practitioners:** Doctors are not fully satisfied and known to e-medicine.
- **Patients' fear and unfamiliarity:** There is a lack of confidence in patients about the results of e-Medicine.
- **Financial unavailability:** as the costs associated with the technology and communication are high it makes telemedicine financially unfeasible.
- **Lack of basic amenities:** In India, about 40% of population lives below the poverty level. Basic facilities like transportation, electricity, telecommunication, safe drinking water, primary health services, etc. are not available. technological advancement cannot change anything if a person has nothing to change.
- **Literacy rate and diversity in languages:** Only 65.38% of India's population is literate and 2% is fluent in English.

- **Technical constraints:** e-medicine supported by various types of software and hardware still needs upgradation. For correct diagnosis, we require biological sensors and more bandwidth support.
- **Quality aspect:** "Quality is the essence" and every one wants it but it can create problems in somecases. In healthcare, there is no appropriate governing body which can form guidelines in this respect and motivate the organizations to follow it. It is left to organizations on how they take it.
- **Government Support:** The government and the private enterprises both have limitations. Any technology in its initial stage needs care and support. Only the government has the resources along with power which can help it to grow and survive, but there is no such initiative taken by the government to develop it.

Telemedicine is an important tool that can be used to treat and evaluate the patients. The greatest value related with telemedicine is not only the lower wait times and the reduced costs that are achieved but improvement in patient satisfaction and allowing more involvement of the patient in the care they receive.[18]

It does not require ample amount of imagination to realize that telemedicine will soon be just another way to see a health professional. Remote monitoring has the capacity to make every minute count by collecting clinical data from many patients simultaneously. However, due to software glitch or hardware meltdown information may be lost.Telemedicine in home has several advantages over hospitalization. It promotes more efficient use of hospital beds, resulting in cost savings, and patients tend to recover more rapidly at home.[19,20]

Conclusion:-

Telemedicine may still be medicine at a distance, but the expectations, technology, and range of applications have changed it. Whether this innovations are going to be millennial landmark change in the health care delivery, which is similar to the development of the modern hospital a century ago, or a set of footnotes which represents only technological alternatives for the near future depends on well-guided research, prudent policy, and the development of technologies. Above telemedicine

article will help to create awareness among society and also help everyone to understand importance in COVID 19 and in Emergency Disease condition.

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