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Telemedicine

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ABSTRACT:
Telemedicine involves the exchange of medical knowledge and the provision of medical care via communication technologies. The delivery of therapeutic, diagnostic, and preventive care as well as patient education and support for self-management of health are all possible with the use of telemedicine. The use of telemedicine on new patient populations without a formal assessment of success is common due to the challenges in determining its efficacy. Using data from other illnesses, it may be able to evaluate the potential use of telemedicine services. During this pandemic, the coronavirus gave rise to an increase in telemedicine use around the globe. This makes it easier for clinicians to evaluate whether a patient has the coronavirus and whether further testing is necessary. Additionally, the World health Organization and the Centers for Disease Control are both promoting the use of telemedicine services like American well Bowie or Doctor on Demand. Virtual clinics are also offered by many hospitals. There are two advantages to calling ahead or visiting online: One benefit is that it prevents someone who is ill from transmitting their sickness, whether it be the flu, a cold, or a coronavirus. Two, it can allow medical professionals more time to focus on patients who need greater attention for extreme symptoms.

KEYWORDS: Telemedicine,COVID 19,Telehealth, Telemedicine specialitycentre, Telemedicine consultationcentre

I. INTRODUCTION:

Telemedicine is the electronic information and communication technology-based provision and support of healthcare services over significant geographic distances.

1) Telemedicine was termed "healing by wire" by Time magazine; healing is denoted by the Latin word "mederi," while distance is denoted by the Greek word "tele." Telemedicine is now a reality and will not go away, despite earlier being considered "futuristic" and "experimental."[1] Telemedicine has several applications in medical treatment, instruction, research, management, and public health.[2]

2)Getting timely, top-notch specialty medical care can be challenging for people living in remote and rural areas all over the world.[3]Residents of these areas frequently lack access to specialty healthcare because it is more difficult to find expert doctors in densely populated urban areas. This gap can be filled and healthcare access in these remote areas improved through telemedicine.[4]

HISTORY OF TELEMEDICINE:

While it may appear that telemedicine is a relatively new application of telecommunications technology due to its recent spike in popularity over the past four or five years, the truth is that it has been in some form for more than thirty years. The National Aeronautics and Space Administration (NASA) made significant contributions to the early development of telemedicine.[5] NASA began experimenting with telemedicine after the first human spaceflight in the early 1960s. Both the ship and the space suits broadcast physiological data while the missions were in progress.[6]One of the earliest telemedicine initiatives, Space Technology Applied to Rural Papago Advanced Health Care (STARPAHC), delivered healthcare to the Papago Indian Reservation in Arizona.[1.] NASA developed it, and it operated from 1972 to 1975. Its goals were to offer basic medical care to the Papago Reservation and to astronauts in orbit.In order to test the idea that good communication will improve community healthcare, the Lister Hill National Center for Biomedical Communication of the National Library of Medicine selected 26 places in Alaska in 1971.[7]

The Telemedicine Centre at Memorial University of Newfoundland has been developing interactive audio networks for the transmission of medical data since 1977.[1]In Australia, the North-West Telemedicine Project was started in 1984 as a test-pilot for a government satellite

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communications network(The Q Network).[1]The project's goals included supplying five remote villages in the area south of the Gulf of Carpentaria with medical treatment for their citizens. NASA launched the first international telemedicine programme, Space Bridge to Armenia/Ufa, in 1989. Under the direction of the US/USSR Joint Working Group on Space Biology, telemedicine consultations were conducted using one-way video, voice, and facsimile technologies between a medical facility in Yerevan, Armenia, and four medical facilities in the US.[7]

DEFINITIONS AND CONCEPTS:

Telemedicine:

The World Health Organization (WHO) defines telemedicine as "the delivery of aid services, wherever distance may be a vital issue, by all aid professionals mistreatment data and communication technologies for the exchange of valid data for diagnosing, treatment, and hindrance of illness and injuries, analysis and analysis, and for the continued education of aid suppliers, tired the interests of advancing the health of people and communities."

Telehealth:

In order to promote long-distance clinical healthcare, patient and professional health-related education and training, public health, and health administration, telehealth is the utilisation of electronic information and telecommunications technologies.[8]

Telemedicine Consultation Centre (TCC):

The patient is located at the Telemedicine Consulting Center. Equipment for scanning, converting, transforming, and sending the patient's medical information may be provided in a telemedicine consulting centre.[9]

Telemedicine Speciality Centre (TSC):

A site where the specialist is present is called a telemedicine specialty centre. He can talk to the patient who is at the distant location while also viewing his reports and keeping tabs on his development.[9]

Telemedicine System:

The telemedicine system is made up of an interface between hardware, software, and a communication channel that will eventually connect two different places geographically in order to exchange information and allow teleconsultation between them. A computer, a printer, a scanner, videoconferencing technology, etc. make up the hardware. The programme makes it possible to gather patient data (images, reports, films etc.). The connectedness that allows two locations to connect to one another is made possible by the communication channel. [10]

Utility Of Telemedicine:

A computer, a printer, a scanner, videoconferencing technology, etc. make up the hardware. The programme makes it possible to gather patient data (images, reports, films etc.). The connectedness that allows two locations to connect to one another is made possible by the communication channel.

1)Remote regions are easily reached.
2)The time and expense of patient transportation can be greatly reduced by using telemedicine in peripheral health setups.
3)monitoring ambulatory monitoring and home careenhances communication between medical professionals that are separated by distance.
4)where patient transfer is not possible, critical care monitoring.
5)Clinical research and ongoing medical education.
6)a means of raising awareness.
7)a catastrophe management tool.
8)second thoughts and intricate interpretations.
9)The biggest hope for telemedicine is that, once communications are established, it may provide knowledge to medical practices.
10)Telemedicine-assisted surgery with hand robots monitoring programmes and disease surveillance.
11)It offers a chance for healthcare delivery to be standardized and equitable across regions and continents as well as inside particular nations.
12)The Centre for International Rehabilitation is aware that telemedicine and communication are crucial tools for enhancing and delivering rehabilitation services in off-the-grid locations. Telemedicine cannot replace doctors in remote locations, especially in developing nations where public health issues are prevalent and resources are limited. Therefore, it is absurd to believe that this technology will eventually replace hesitantdoctors. However in most nations, it can serve as a significant boost to the prevailing health situation.

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Figure 1: A Modern Telemedicine System([1,9,11-13])

TYPES OF TECHNOLOGY:

Most current telemedicine applications consist of two different types of technologies. Digital picture transfers are done using the first method, known as store and forward. A digital image is captured with a camera, "stored," and then "forwarded" to another location by a computer. When a diagnostic or consultation might be done and delivered back within the following 24 to 48 hours in non-emergency scenarios, this is often employed. Examples include telepathology, teledermatology, and teleradiology.[14]When a "face-to-face" consultation is required, the second extensively utilised device, the two-way interactive television (IATV), is used. The patient is present at the originating site, together with their provider, who may occasionally be a nurse practitioner, telemedicine coordinator, or any mix of the three. The specialist is present in the referral location, which is typically an urban hospital. A "real-time" consultation can be held thanks to videoconferencing technology at both sites.[15]Nearly all medical specialities, including psychiatry,internal medicine, rehabilitation, cardiology, pediatrics, obstetrics and gynaecology, and neurology, have been discovered to be favourable for this type of consultation.[15]

TELEMIDICINE VS PANDEMIC:

Since the coronavirus, telemedicine has quickly evolved. However, not all kinds of the practise have made a seamless transition. Care, particularly for physicians who are experienced to daily patient encounters. In the past it's strange to see so few actual patients. A lot of doctors have learned from this to put it bluntly, they lack experience because they are so accustomed to having a priority list and how they look after our patients as directed by who is scheduled for that day. Additional factors that have grown to be crucial in the terrible crisis is a severe illness, a patient's conversations.

Discussing options with patients and their families, as well as whether or not they would want to be put on a ventilator if their sickness advanced quickly as a result of Covid and they were unable to breathe, is important if they had chronic medical conditions. So, once more, a lot of the things we used to take for granted would actually occur. In this video-only environment, we are currently being driven to reinvent. The health care industry was able to keep some business thanks to telemedicine, but visitation rates are still declining. Over time, such can have a negative financial impact on the system. When there is a pandemic, in-person visits fall by 80%, but our telehealth visits make up the difference and restore them to where they were before. As part of the Coronavirus Aid, Relief and Economic Security Act, hospitals and other healthcare providers will get roughly 175 billion dollars to make up for increased costs and lost revenue. It might not be sufficient to save them, though. Hospitals are being severely impacted financially by this situation. These patients spend a lot of time in the hospitals. Therefore, without assistance from the federal and state governments,

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hospitals would be unable to bear this financial strain.([15])

RISE OF TELEMEDICINE DURING COVID-19 TIMES:

Since the middle of the 20th century, radios have been used to transmit medical advice on ships. First things first in hospitals utilisation was for psychiatric purposes using a closed-circuit television hookup in the 1950s consultations. In the previous 30 years, telemedicine the scope of treatment now includes mental health, people with chronic illnesses like stroke and diabetes, heart failure, or asthma. Several studies have discovered it to be an efficient substitute that is satisfying for the both the client and the supplier. Telehealth its supporters have marketed it as a remedy for individuals in rural areas. Now they promote it as a low-cost and practical choice for both busy parents and tech-savvy millennials. According to a 2019 American Well research, 66% of Americans are open to using telehealth, but only 8% have actually done so. The action made it possible for private insurers and other parties to waive their limitations. The new exceptions, however, did not nullify any potential telehealth obligations that states might have. Telemedicine has been promoted as a way to protect medical staff from COVID19 exposure, to lessen the need for personal protective equipment, and to keep the weak and healthy at home. By the end of 2020, coronavirus may have increased the number of telehealth encounters to one billion. During the coronavirus, telemedicine companies like Teladoc and American Well saw a significant increase in subscribers. Pandemic they were able to connect as a result of most states' demand temporally Changing the requirements for licences for doctors, i.e., a physician in one state a patient in another state be diagnosed. That resulted teledoc is listed by credit Suisse as one of their top ten investment suggestions for COVID-19.Even IT firms are stepping into the Space for telemedicine.

THE FUTURE OF HEALTH CARE IN HEALTH MEDICINE:

The health care system is already at breaking point due to the novel coronavirus outbreak. Although COVID19 may be dominating the news, folks are also becoming ill from other illnesses and wounds. Doctors are now searching for other methods to treat them with the least amount of interaction. The use of software and electronic communications to monitor and treat patients instead of having them come into a hospital is known as telemedicine. The industry of telehealth, which encompasses all digitally provided medical services and health education, has gradually expanded over the past ten years.(fig:2)

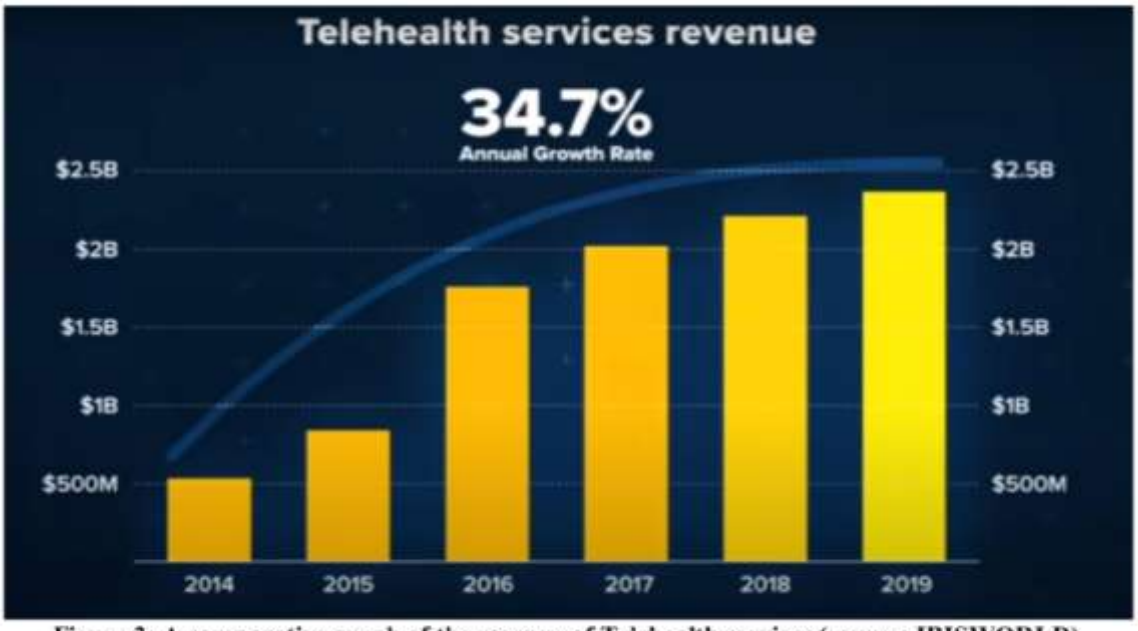

Figure 2: A comparative graph of the revenue of Telehealth services (source: IBISWORLD)

International Journal of Pharmaceutical Research and Applications
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IBIS World estimates that the industry's revenue increased 34.7 percent between 2014 and 2019. The market was worth about 45 billion dollars in 2019, but by 2026, it is expected to reach more than 175 billion. American consumers have been sluggish to adopt the technique despite the rise in money. A 2017 research found that 82% of Americans don't use telemedicine. That changed when the novel coronavirus emerged, just like it did for every American.(fig:3)

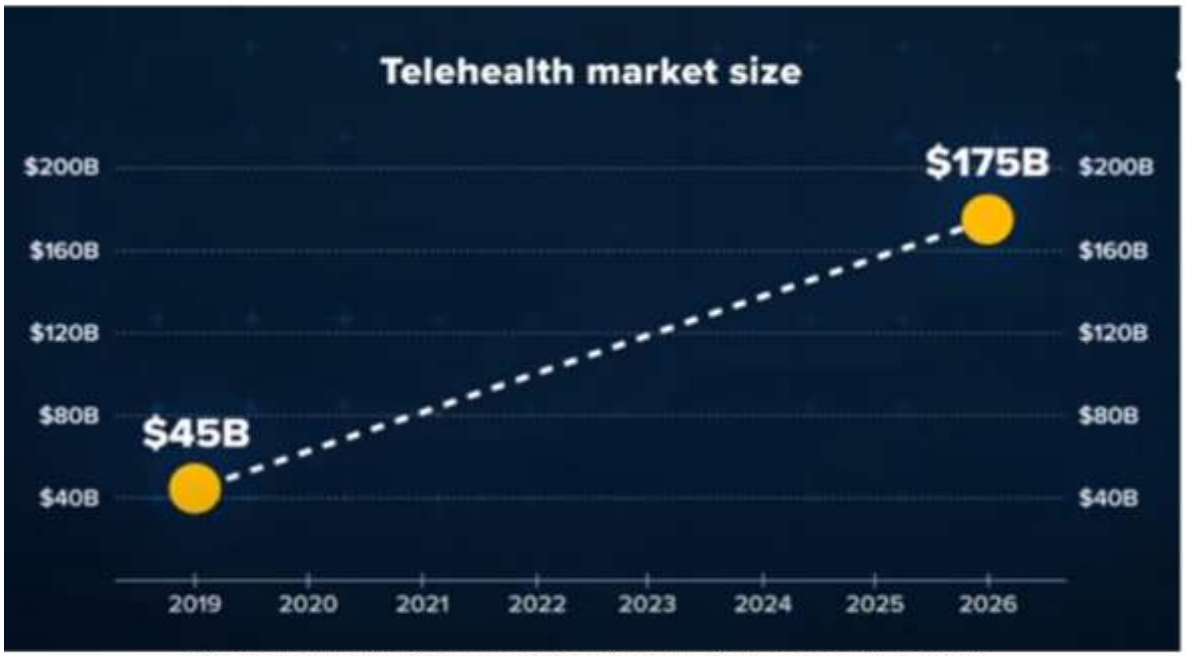

Figure 3: Market of Telemedicine (Source: Global Market Insight)

- More than 650,000 Medicare beneficiaries use telehealth each week, up from just 11,000 the previous week. Telemedicine businesses like American Well and Teledoc have seen an increase in utilisation as a result. And Zoom, a provider of video conferencing, whose stock has increased by more than 150% since the year 2020 began. Shares of Microsoft, the company that owns Skype and the platform used by its employees, have increased by more than 14% since the year 2020 began. In March, telemedicine visits increased by 50%, and by the end of 2020, 200 million will have been performed. In March, telemedicine visits increased by 50%, and by the end of 2020, 200 million will have been performed. That is more than the 36 million estimates from previously. The major method of care for the coronavirus pandemic in America has shifted from testing telemedicine to deploying it immediately. The future of health care may be telemedicine.([13])

INFRASTRUCTURE:

The following categories could be used to categorize telemedicine centres:

• Center for Primary Telemedicine (PTC)
• Second-level Telemedicine Facility (STC)
• TTC, or Tertiary Telemedicine Center

PTCs, STCs, and TTCs would be based in Primary Health Centers, Secondary Medical Centers, and Tertiary Medical Centers, respectively. In the framework of the Telemedicine Consulting and Specialist Centers (TCC), the Hardware Requirements / Standards (TSC).[9]

Integrated Services Digital Network (ISDN):

ISDN is a digital dial-up connection to the telecommunications provider that is not dedicated and is used on a call-by-call basis. Information can be transmitted over an ISDN line at a speed that is almost five times faster than that of analogue modems via POTS (plain old telephone service).[16]

T-1:

To transport speech and data digitally at 1.554 megabits per second, this is the foundation of the digital service offered to the end user (usually a business) in the United States today (Mbps). It can be set up for ISDN service and used to transmit analogue and digital voice, data, and video signals.[16]

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Plain old Telephone Services (POTS):

The most extensively used telecommunications technology in the world is POTS, which transfers data at a rate of up to 56 kilobits per second (kbps) (Bezar 1995). For audio conferencing, store-and-forward communication, Internet, and low bandwidth videophone conferencing, POTS may be appropriate.[16]

Internet:

The delivery of specific types of patient care is significantly impacted by the Internet. Internet Health Care Magazine polled 1,000 Chief Intelligence Officers (CIOs), and found that 65% of them indicated their company had a website, with another 24% saying it was being developed. Many customers now have access to online patient scheduling, health education, lab work reviews, and even email consultations thanks to the growing number of e-health websites on the Internet.[16]

Application of Telemedicine in Public Health:

An Epidemiological Surveillance:[17]

With the advancement of technology, such as geographic information systems, telemedicine applications for epidemiological surveillance are gradually reaching new heights (GISs).

•It can provide important information for assessing population health as well as new understanding of the regional distribution and gradients in the prevalence and incidence of diseases.

•Additionally, it offers useful details about various groups at risk based on risk factor profiles.

•It aids in differentiating and defining the population's risk variables.

•Additionally, it aids in the planning of interventions and the evaluation of the efficacy of different interventional tactics.

•It can be extremely important in predicting epidemics.

•It is a crucial tool for both local and worldwide real-time disease surveillance.

•In order to perform spatial-temporal modelling of climate, environment, and disease transmission, GIS provides the fundamental architecture and analytical tools necessary. These tools are useful in comprehending the spread of vector-borne diseases. Recently, this has involved the use of remote sensing techniques.

Telemedicine In India:

•Every citizen might have instant access to the proper specialist for medical advice in a utopian society. But this can't even be a dream in the actual world. "All Men Are Equal, But Some Are More Equal Than Others" is a universal truth. In India, we are now unable to offer complete primary healthcare in the rural areas. Even in suburban and metropolitan settings, access to secondary and tertiary medical care is not always guaranteed. Even in suburban regions, incentives to encourage specialists to practise have been ineffective.[18]

•In contrast to the dire situation in healthcare, India is rapidly increasing its level of computer literacy. Healthcare professionals today view telemedicine as their just discovered Avatar. Theoretically, it would be far simpler to install a first-rate telecommunications network in suburban and rural India than it would be to station hundreds of medical specialists there. We now understand that fibre optic cables and satellite-based technology are essential for the development of communications.[18]

The Beginning:

The Apollo group of hospitals was a pioneer in launching a pilot project at a secondary level hospital in the Andhra Pradesh village of Aragonda, which has 5000 residents and is 16 kilometres from Chitoor. Today, the rural hospital boasts a cutting-edge videoconferencing system and a VSAT (Very Small Aperture Terminal) satellite built by ISRO, having started with basic web cams and ISDN telephone connections (Indian Space Research Organisation). The Sriharikota Space Center project, which is 130 km from Chennai, was added to this and served as the Indian Space Research Organization's crucial launch pad in this area.[2]

CHALLENGES:

• patients fear and unfamiliarity: Patients lack faith in the effectiveness of electronic medicine.

• Financial unavailability : Telemedicine can occasionally be financially unviable due to excessive technology and connectivity costs.

• Lack of basic amenities : Nearly 40% of people in India are considered to be poor. There are a number of essential services lacking, including transportation, electricity, telecommunication, safe drinking water, and primary healthcare. When a person has nothing to change, nothing can be changed by technology.

• Literacy rate and diversity in languages : Only2% of India's population is fluent in English, while only 65.38% of the country's population is literate.

• Technical constraints : A variety of software and hardware platforms supporting e-medicine still need to develop. We need more bandwidth support and sophisticated biological sensors for accurate diagnosis and data pacing.

• Quality aspect : Everyone believes that "quality is of the utmost importance," but this can

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occasionally lead to issues. Without a suitable regulating authority to create regulations in this area and encourage organisations to adhere to them, healthcare organisations are totally responsible for how they implement them.

• Government Support : Both the government and private businesses are subject to limits. Any technology in its infancy requires attention and support. Only the government has the means and authority to support its survival and expansion. The administration has not taken any such steps to develop it.([9,15,19])

II. CONCLUSION:

It doesn't take much of a stretch to imagine that telemedicine will eventually be just another way to consult a medical expert. By simultaneously receiving clinical data from numerous patients through remote monitoring, it is possible to make every minute count. However, data loss could occur as a result of a device failure or software bug. Therefore, it may be dangerous to rely too heavily on a computer system to guard against mistakes in medical data. The utilisation of human intelligence must be balanced with complete reliance on computer solutions. Finding that balance could be the key to saving someone's life. The potential of telemedicine, telehealth, and e-health in 2008 is still only partially realised.[20] Telemedicine is, in the words of Neil Armstrong, "one modest stride for IT but one gigantic leap for healthcare," and only time will reveal whether it is a "forward step in a backward direction."

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