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# TELEHEALTH

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# TELEHEALTH

## Definition

Telemedicine is an upcoming field in health science arising out of the effective fusion of Information and Communication Technologies (ICT) with Medical Science having enormous potential in meeting the challenges of healthcare delivery to rural and remote areas besides several other applications in education, training and management in health sector. It may be as simple as two health professionals discussing medical problems of a patient and seeking advice over a simple telephone to as complex as transmission of electronic medical records of clinical information, diagnostic tests such as E.C.G., radiological images etc.

Telemedicine literally mea"distance healing" being derived as it does from ns the Greek word"tele"meaning"distance"and the Latin term"mederi"meaning,"to heal".

**Distinguishing between the terms telehealth and telemedicine** is a useful way to begin: “Telehealth is the use of information and communication technology (ICT) to deliver health services, expertise and information over distance. It includes Internet or web-based ‘e-health’ and video-based applications, and can be delivered ‘real-time’ or through ‘store-and-forward’ mode. Telehealth is unique in having the capability to cross geographical, temporal, political, social and cultural barriers within the health sector... Telemedicine is often used interchangeably with telehealth, however the term telemedicine generally implies a physician mediated interaction with patients.”

## Benefits

Telemedicine presents many benefits, such as improving access to care, promoting care coordination, fostering patient engagement, and reducing costs. Additionally, telemedicine programs can and have been implemented in a variety of ways, such as facilitating remote second opinions, on-demand and scheduled appointments, and triage in emergency departments, as well as promoting provider-to-provider communications. However, there are many legal pitfalls that are important to consider when implementing a telemedicine program.

Telehealth services use information and communications technologies (ICTs) to deliver health services and transmit health information over both long and short distances. It is about transmitting voice, data, images and information rather than moving care recipients, health professionals or educators. It encompasses diagnosis, treatment, preventive (educational) and curative aspects of healthcare services and typically involves care recipient(s), care providers or educators in the provision of these services directed to the care recipient.

Video-conferencing is one of the main ways in which telehealth is improving access to healthcare services for patients who live in regional, rural and remote areas. Instead of having to travel to the nearest major city to see a specialist, an increasing number of patients are using video-conferencing. This facility might be offered by their local GP or another local healthcare venue.

## Uses

1. Concierge services for fee paying patients: 91 percent
2. Medication management/prescription renewal: 86 percent
3. Minor urgent care (i.e. pink eye, fevers): 85 percent

4. Birth control counseling: 83 percent
5. Home health care: 82 percent
6. Chronic condition management: 80 percent
7. Pediatric after-hours needs: 79 percent
8. Behavioral health: 77 percent
9. Post-hospital discharge: 73 percent
10. Post-surgical follow-up: 59 percent

**Importance of Telehealth**

Telehealth is emerging as a critical component of the healthcare crisis solution. Telehealth holds the promise to significantly impact some of the most challenging problems of our current healthcare system: access to care, cost effective delivery, and distribution of limited providers. Telehealth can change the current paradigm of care and allow for improved access and improved health outcomes in cost effective ways.

1. **Telehealth increases access to healthcare:**
- Remote patients can more easily obtain clinical services.
- Remote hospitals can provide emergency and intensive care services.

2. **Telehealth improves health outcomes:**
- Patients diagnosed and treated earlier often have improved outcomes and less costly treatments.
- Patients with Telehealth supported ICU's have substantially reduced mortality rates, reduced complications, and reduced hospital stays.

3. **Telehealth reduces healthcare costs:**
- Home monitoring programs can reduce high cost hospital visits.
- High cost patient transfers for stroke and other emergencies are reduced.

4. **Telehealth assists in addressing shortages and misdistribution of healthcare providers**:
- Specialists can serve more patients using Telehealth technologies.
- Nursing shortages can be addressed using Telehealth technologies.

5. **Telehealth supports clinical education programs:**
- Rural clinicians can more easily obtain continuing education.
- Rural clinicians can more easily consult with specialists.

6. **Telehealth improves support for patients and families:**
- Patients can stay in their local communities and, when hospitalized away from home, can keep in contact with family and friends.
- Many telehealth applications empower patients to play an active role in their healthcare.

7. **Telehealth helps the environment**:
- Reducing extended travel to obtain necessary care reduces the related carbon footprint.

8. **Telehealth improves organizational productivity:**
- Employees can avoid absences from work when telehealth services are available on site or when employees can remotely participate in consultations about family members.

- These examples illustrate the some improved outcomes and cost savings being achieved by Telehealth and telehealth programs:
- Home monitoring of chronic diseases is reducing hospital visits by as much as 50% by keeping patients stable through daily monitoring.
- The national average for re-admission to hospitals within 30 days following a heart failure episode is 20%. Telehealth monitoring programs have reduced that level to less than 4%.
- Timely provision of treatments that effectively reverse the consequences of a stroke have risen from 15% to 85% due to the availability of telestroke programs.

Telehealth support to Intensive Care Units (often called eICUs) is reducing mortality rates by 15 – 30% and substantially reducing complications and length of stay. Telehealth retinopathy screening programs support early identification of serious eye disease and reduce the incidence of blindness in diabetic patients.

**Objectives and Advantages**

**The main objective of telemedicine is**

a. It crosses the geographical barriers and provide healthcare facilities to rural and remote areas (health for all) so it is beneficial for the population living in isolated communities. Besides this other advantages telemedicine are
b. Eliminate distance barriers and improve access to quality health services In emergency and critical care situations where moving a patient may be undesirable and/or not feasible
c. Facilitate patients and rural practitioners' access to specialist health services and support
d. Lessen the inconvenience and/or cost of patient transfers
e. Reduce unnecessary travel time for health professionals
f. Reduce isolation of rural practice by upgrading their knowledge through tele-education or tele-CME

**Significance of Telemedicine**

1. By video, e-mail, telephone etc, consulting with doctors across, state, national, and international borders is now being done every day. This tele assistance is rapidly growing.

2. Videoconferencing for diagnosing or educational purposes. A doctor in one hospital can talk with a patient or doctor in another area to speed diagnoses and their accuracy. A surgeon can watch a procedure remotely and consult to make sure things go smoothly. Medical school students can learn medical procedures without having to be in the operating room.

3. Sites containing medical information are popping up on the web every day. One can go to find information on a certain condition or treatments, read up on medical interests, buy products, or even visit a" cyberspace telemedical office".

4. The use of telemedicine to reach undeserved areas such as rural sections of the country or military bases in other countries is a huge area being researched now. The benefits of these services could be amazingly far reaching.

5. Remote supervision of physicians' assistants or nurses can be done by means of telecommunications.

6. A highly controversial, but possible, use of telemedicine for the future is the establishment of large medical records databases.

7. An already extremely common use of telemedicine today, research data bases such as Medline make medical research infinitely more efficient than before.

**How is Telemedicine Enhancing Healthcare Delivery?**

The concept of telemedicine has become increasingly useful in the healthcare sector, particularly, to reach out to rural and remote regions, where direct healthcare delivery is hard to access. However, today, it is also being used in several other applications in healthcare management, training, and education.

Telemedicine can be anything from the discussion of health professionals for seeking advice over patient problems, to complex transmission of medical records, clinical information, and diagnostic tests results through technical devices. Telemedicine uses high bandwidth for information transmissions for video conferences, broadcasting, and virtual reality.

Several common medical devices are also adapted for use with telemedicine and mobile technology. Today, many state-of-the-art hospitals indulge in interactive real-time medical video conferences with desktop or mobile based software and hardware or even by using mobile / satellite / terrestrial network telecommunication or broadband media connections.

In India, telemedicine is gaining progressive advances due to further technological development. Telemedicine aims to provide healthcare services beyond geographic, time, and social barriers. Usually, these services are targeted towards remote regions where there is a shortage of physicians or specialists.

Today, Telemedicine is emerging as one of the critical components of the healthcare solution that facilitates healthcare delivery and distribution, with significant impact on cost and convenience.

**Types**

Types of Telemedicine process can be categorized in two ways i.e. technology involved and application adopted.(a)Technology involved:

- **Real Time or Synchronous**: Real time telemedicine could be as simple as a telephone call or as complex as telemedical video conference and tele-robotic surgery. It requires the presence of both parties at the same time and a telecommunication link between them that allows a real-time interaction to take place. Video-conferencing equipment is one of the most common forms of technology used in synchronous telemedicine.
- **Store-and-forward telemedicine or Asynchronous**: It involves acquiring medical data (like medical history, images, etc) and then transmitting this data to a doctor or medical specialist at a convenient time later for assessment offline.

It does not require the presence of both parties at the same time. Examples are tele-pathology, tele-radiology, and tele-dermatology.

Telehealth is defined as the delivery and facilitation of health and health-related services including medical care, provider and patient education, health information services, and self-care via

telecommunications and digital communication technologies. Live video conferencing, mobile health apps, "store and forward" electronic transmission, and remote patient monitoring (RPM) are examples of technologies used in telehealth.

Telehealth and Telemedicine

The terms telehealth and telemedicine are often used interchangeably, but telehealth has evolved to encapsulate a broader array of digital healthcare activities and services. To understand the juxtaposition of telehealth and telemedicine, it is essential first to define telemedicine.

**What is Telemedicine?**

Oxford's telemedicine definition is "the remote diagnosis and treatment of patients by means of telecommunications technology." Telemedicine encompasses the use of technologies and telecommunication systems to administer healthcare to patients who are geographically separated from providers. For example, a radiologist may read and interpret the imaging results for a patient in a different county whose hospital does not currently have a radiologist on staff. Or a physician may conduct an urgent-care consultation via video for a non-life-threatening condition.

Where telemedicine refers specifically to the practice of medicine via remote means, telehealth is a blanket term that covers all components and activities of healthcare and the healthcare system that are conducted through telecommunications technology. Healthcare education, wearable devices that record and transmit vital signs, and provider-to-provider remote communication are examples of telehealth activities and applications that extend beyond remote clinical care.

**Telehealth Technology**

Several technologies are being deployed for telehealth including mHealth (or mobile health), video and audio technologies, digital photography, remote patient monitoring (RPM), and store and forward technologies.

mHealth—Using Smartphones and Tablets for Telehealth

Today, 95 percent of Americans own cell phones and 77 percent own smartphones. These and other mobile devices can be leveraged to promote better health outcomes and increased access to care. mHealth or mobile health refers to healthcare applications and programs patients use on their smartphones, tablets, or laptops. These applications allow patients to track health measurements, set medication and appointment reminders, and share information with clinicians. Users can access hundreds of mHealth applications including asthma and diabetes management tools as well as weight loss or smoking cessation apps. Additionally, mobile devices allow users to schedule appointments and communicate with providers via video conference and text message.

**Research support**

Wyoming Medicaid conducted a study measuring engagement and post-birth outcomes for patients who used a mobile health app called, "Due Date Plus." Use of the app, which allowed women to record pregnancy milestones, access medical services, and find symptom-related information was associated with increased compliance with prenatal care and decreased occurrence of babies born with low birth weights.

Video Conferencing, Video-Scopes, and High-Resolution Cameras in Telehealth

Clinicians are conquering distance and providing access to patients who are not able to travel by providing appointments utilizing real-time video communication platforms. Video conferencing technology has been utilized to provide care for inmates, military personnel, and patients located in rural locations for some time. Also, suppliers of both care and financing such as Kaiser Permanente, the Defense Department, and the Department of Veterans Affairs have been exploiting telehealth modalities to increase access to healthcare services and promote better care quality. In another example, S.C. Department of Corrections and the Medical University of South Carolina are using video scopes and high-resolution cameras to diagnose and treat inmates remotely. They are also conducting virtual appointments using video/audio communication applications to reduce prisoner transportation costs and increase safety by keeping inmates in and providers out of correctional facilities.

**Remote Patient Monitoring (RPM)**

Remote Patient Monitoring involves the reporting, collection, transmission, and evaluation of patient health data through electronic devices such as wearables, mobile devices, smartphone apps, and internet-enabled computers. RPM technologies remind patients to weigh themselves and transmit the measurements to their physicians. Wearables and other electronic monitoring devices are being used to collect and transfer vital sign data including blood pressures, cardiac stats, oxygen levels, and respiratory rates.

**Telehealth Services and Applications**

Since the internet and mobile devices now pervade our lives, it is natural that people want to leverage telehealth technologies to improve care, offer convenience, promote access, and support sustainability. Telehealth services range from consultations and video conference mental health sessions to public health broadcast text messaging and on-demand provider education.

**Applications**

**A. Telehealth Addresses Primary Care Physician Shortages/Specialist Scarcity:** Telehealth is allowing patients at smaller, less-resourced hospitals to gain access to specialists based at larger regional facilities. Undeniably, lack of access and hard-to-reach populations are drivers of telehealth innovations as supported by this 2014 MUSC study on the use of telehospitalists to address physician shortages. Telehealth is being implemented to treat prison populations, as well as being deployed in rural communities and underserved urban areas to improve healthcare availability.

**B Telehealth for Education and Training:** Numerous organizations provide healthcare education with the help of digital telehealth technologies including Harvard's Safety, Quality, Informatics and Leadership (SQIL) program which takes a blended learning approach. SQIL uses on-demand content combined with in-person training to create a new medical education model that uses "information technology (IT), data, and a culture of continuous improvement to enable healthcare organizations to evolve into true learning systems." Time-crunched physicians are increasingly using online and mobile platforms to meet their CME and MOC requirements, and to prepare for Board Exams.

**C. Telehealth and Patient Engagement:** With telehealth technologies, patients are taking more control of their well-being. Educational videos, health management apps for mobile devices, and online health learning and support communities empower patients to manage chronic conditions, lose weight, increase physical activity levels, and gain emotional support. Diabetes patients are benefiting from carbohydrate tracking apps and are using glucose monitoring devices to document and report their blood sugar measurements. Other patients are interacting with their providers and scheduling appointments through secure online communication portals. Additionally, they are accessing health education content via smartphones and computers to add to their self-care toolboxes. They are also using wearables and monitoring systems to gain knowledge about their sleep patterns, vital signs, and activity levels.

**D. Telehealth and Provider Communication:** A significant telehealth development is the increased communication via digital and telecommunications platforms among care providers. Care teams are enabled through telehealth technologies to more easily share information and collaborate in the treatment of their patients. PCPs are using telehealth platforms to consult with specialists and other providers to promote access for their patients in low provider availability areas.

**Research support**

- More widespread use and success of telehealth applications might spur the resolution of these reimbursement issues. CVS has been providing clinical services via telehealth since 2015. According to their study in the Journal of General Internal Medicine, 95 percent of patients "were highly satisfied with the quality of care they received, the ease with which telehealth technology was integrated into the visit, and the timeliness and convenience of their care." If CVS's merger with Aetna is finalized, increased competition may motivate other payers to find ways to offer telehealth services and, by extension, levels of reimbursement.
- 95 percent of patients "were highly satisfied with the quality of care they received, the ease with which telehealth technology was integrated into the visit, and the timeliness and convenience of their care. "

**Research support**

- With the recent news that Amazon's Jeff Bezos, Berkshire Hathaway's Warren Buffet, and J.P. Morgan Chase's Jamie Dimonhave teamed up to disrupt healthcare, it's easy to speculate that telehealth technology will be a key strategy in efforts to bring down costs. Other employers are seeking to bring down prices as well with the help of telehealth. According to the Society for Human Resource Management (SHRM), not only are employers encouraging the use of telehealth services, their employees, many of whom are digital natives, are quite comfortable using these services. Because of remote healthcare's lower costs and increased worker productivity and satisfaction, organizations will likely seek telehealth solutions. Moreover, payers, like employers, may be lured by decreased medical expenditures and consumers may be motivated by the convenience and promptness of care that it offers.
- Robotic Surgery via VR Telemedicine

- A surgeon can now use a console and operate robotic arms that are enabled to make more delicate movements than human hands (as a result of robotic dexterity that can't be matched by human wrists). This means that surgery that is minimally invasive can become highly precise by going with a robotic option.
- Traditional laparoscopy is where a surgeon needs to inspect a 2D video screen before making any movements. But with VR, surgeons can now watch a 3D video and engage in surgical maneuvers without ever looking away. This improvement has made a huge difference when it comes to telemedicine.
- Current technology like the da Vinci system was used just a few feet away from the patient. But as VR evolves, it's now possible to make the experience immersive with 3D consoles to support telemedicine in a number of different ways from far away.
- Telemedicine and Augmented Reality
- While VR can give you an immersive experience that can be hyper-real and sometimes fantastical by incorporating finely tuned sound and haptic feedback, Augmented Reality (AR) uses similar technology to enhance the here and now.
- Right now, telemedicine is pretty loosely defined as a domain. At present, it's just perceived as providing healthcare services from a distance via telecommunications tools. So there's a lot of room to grow in this niche as telemedicine can be anything like video chat meetings (check out our custom built VideoMedicine app), remote patient monitoring (check out the solution we created for Norway's Innlandet Hospital Trust), and highly advanced remote surgery.
- The latter fuses both telemedicine and AR technologies to enable surgeons to operate on patients located far away. This is a departure from fictional virtual environments as it's based on real-time sensory data. As a result, a surgeon located in one place can perform a surgical procedure in another location.
- Dr.MehranAnvari, Scientific Director & CEO at Centre for Surgical Invention & Innovation (CSII), has shown that these distances can be as far 932 miles.
- Although robotic surgery will continue to grow significantly, VR in telemedicine is far from limited.
- VR Telemedicine in Skills Training
- 1.VR technology has been incorporated into training various professionals for some time now. These cover industries such as the military apparatus and space exploration.

- 2. Some of the same technologies that are being used in other industries can be incorporated into healthcare as a knowledge transfer tool to help physicians working in rural areas. This, in turn, can also enhance quality assurance and peer review while enabling the completion of complex medical procedures.
- 3. Further, in emergency situations, non-clinicians can also receive expert training for procedures like administering CPR.
- But this technology is still in its infancy, so although VR in telemedicine has advanced significantly, there is still a long way to go.
- Like any emerging technology, there might be hurdles to overcome before we see the true value of VR technology in healthcare. These can be low adoption rates and high costs, but these bumps on the road can be relative.
- VR technology has the potential to lower expenses over time by reducing the need to spend on more medical equipment. Further, it can also expedite certain procedures which will make it highly cost-effective.
- VR technology in telemedicine is still pretty close to the starting line, so expect it to have a much bigger impact on the industry over the next three years.

**Applied Telehealth**

- 1 Tele-Health Care: It is the use of information and communication technology for prevention, promotion and to provide health care facilities across distance. It can be divided in the following activities-Teleconsultation-Telefollow-up
- 2 Tele-Education:Tele-Education should be understood as the development of the process of distance education (regulated or unregulated), based on the use of information and telecommunication technologies, that make interactive, flexible and accessible learning possible for any potential recipient.1
- 3 Disaster Management:Telemedicine can play an important role to provide healthcare facilities to the victims of natural disasters such as earthquake, tsunami, tornado, etc and man-made disaster such as war, riots, etc. During disaster, most of the terrestrial communication links either do not work properly or get damaged so a mobile and portable telemedicine system with satellite connectivity and customized telemedicine software is ideal for disaster relief.
- 4 Tele-Home Health Care: Telemedicine technology can be applied to provide home health care for elderly or underserved, homebound patients with chronic illness. It allows home healthcare professionals to monitor patients from a central station rather than traveling to remote areas chronically ill or recuperating patients for routine check-ups. Remote patient monitoring is less expensive, more time savings, and efficient methodology. Tele-home care virtual visits might lead to improved home health care quality at reduced costs, greater patient satisfaction with care, increased access to healthcare providers and fewer patients needing transfer to higher, more costly levels of care. A Computer Telephone Integrated (CTI) system can monitor vital functions of patients twenty four hours a day

**Indian Scenario**

- The rapid growth of telemedicine in the last few years appears to be standing as the next frontier in the healthcare field.
- Despite the challenges and risks involved in telemedicine, the demands of the healthcare industry in the near future can only be met by implementing effective and innovative telemedicine solutions.
- Overall, the upsurge of telemedicine has been changing the current paradigm of health care, allowing improved access to patient care along with enhanced health outcome in cost-effective ways.
- The integration of e Health and telemedicine services is being done through the National Medical College Network (NMCN) by interlinking the Medical Colleges across the country with the purpose of e-Education and National Rural Telemedicine Network for e-Healthcare delivery. Considerable amount of effort has already been undertaken to give a shape to the project. Locations for the National Resource Centers and Regional Resource Centers for NMCN have been defined.
- The medical colleges to be linked to these five regional centers have also been worked out. Communication from MOHFW had been sent to all the states and Union Territories to provide the list of medical colleges to be networked and to nominate a faculty member from each medical college as Nodal Officer for Telemedicine. High speed optical fiber based Internet bandwidth been deployed under National Knowledge Network (NKN) Project in as many as 150 medical colleges around the country. Many Medical Institutions have migrated to NKN backbone to enhance their capacity of telemedicine activity using telemedicine platform deployed by Central and State government agencies.
- The National Digital Health Authority of India (NDHAI) is in the process of being set up and has been clearly defined as an action item in the National Health Policy 2017. The MOHFW has already notified the Standards to be used for exchange of health information. The second edition of the standards was notified in December 2016. Further, an Integrated Health Information Platform (IHIP) is being set up for exchange of health information in an interoperable manner.
- India has come a long way in adopting the evolving technology and making healthcare delivery accessible. The concept of Telemedicine in a Digital Village of Digital India is also being tried out through the Common Service Centres (CSCs) where private entrepreneurs are empowered and encouraged.

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