**TELEHEALTH TECHNOLOGY AND HEALTHCARE**

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**ABSTRACT**

 Telehealth refers to the use of information and communication technologies to provide health care services and medical education to the patient in distance rather than face-to face service. In telemedicine, clinical care to the patient is provided remotely using telecommunication and electronic technologies. Use of information and communication technologies to provide health care services have many advantages, including cost savings, convenience, provide care to patients with mobility limitations, or in remote areas who don’t have access to local physicians or clinic. The disadvantage of telehealth is that handling of emergency conditions, surgeries, lab investigations, ability to perform limited physical examination, and every type of visit is not possible remotely. Telehealth, has raised issues like conflicts between various aspects of technology usage, security breaches, inaccurate and obsolete data etc. The quality and accuracy of online information and patient’s medical information confidentiality also is of deep concern. The expansion of telehealth services is expected to grow and has potential to improve patient satisfaction by delivering high quality and value of care services

1. **INTRODUCTION:**

 The literal meaning of telehealth is “healing at a distance”. Telehealth is a mechanism for delivery of more efficient and patient centred health care services to individuals living in a remote and hard to reach areas. These individuals usually have to face physical and financial barriers for quality health care services. The telehealth technology has enabled clinicians, nurses and other health care providers to provide health care services from a distance. Information and Communication Technology (ICT) is used in telehealth. In telemedicine clinical care is provided remotely using teleconsultation, telediagnosis etc. Whereas in telehealth services are provided beyond telemedicine like preventive health care services, health and medical education for general public and professionals respectively. The electronic health (eHealth) is the term used for whenever any form of electronics is involved for health care delivery, support and management (1). Mobile health (mHealth) is electronic health care delivery through mobile devices. Digital health and care refers to tools and services that use ICT technologies to improve prevention,diagnosis, treatment, monitoring and management of health related issues and also to monitor life-style habits. (2).

 In 1876, Alexander Graham Bell, inventor of telephone used telephone to call his assistant for help after spilling acid on his trousers which is considered to be the earliest telehealth encounter (3). In 1920, two ways television and audio signals were used to communicate and subsequently formal recognition of telemedicine started. In 1950, Dutch physiologist utilized the telephone for transmission and monitoring of cardiac sounds and rhythms. Radio was used for medical help from Australian’s flying doctors. In late 1950s and early 1960s first telemedicine was used to transmit video, images and complex medical data (4). In 1975, telecardiology system was established in Guwalior, India (5). Radiology fully adopted telemedicine in the 1980s.PACS allowed instant access to radiological images at different location of the Hospitals. Now a days teleradiology is used to access report from anywhere across the globe. Tele-thethoscope, tele-ECG and tele-pathology are special tools used in telehealth. The term Telehealth was used over 40 years ago for delivery of health services. In telehealth there is use of technologies such as radio, telephones, television and internet to provide health services at a distance, rather than in face-to-face settings. The technologies used in telehealth and innovative practices have changed dramatically with time. Telehealth is less popular than the face-to-face delivery of health services. (6).

Telehealth, is a subset of E-Health. Telehealth is the term for various clinical and non-clinical services provided from a distance. Telemedicine is a subset of telehealth. In telemedicine clinical services are delivered by the clinicians to the patients with the use of electronic communications technologies and software (7).

The adoption of telehealth had been very slow prior to COVID-19 pandemic. But the COVID-19 pandemic had surged the use of telehealth for treatment and care of COVID positive cases; prevention of COVID-19 and training of service providers for the management of cases. Telehealth played a vital role during the COVID-19 pandemic by bridging the gap between people and healthcare settings. People were able to communicate with health service providers through virtual channels while staying at home (8-9).

At present there are four types of telehealth - live video-conferencing (synchronous), asynchronous meetings, remote patient monitoring, and mobile health monitoring (10). Telehealth is a method of health care delivery that increases access to health care services; maintain and facilitate patient-centered care. Telehealth includes telerehabilitation, telecare, teleconsult, telemedicine and remote nonclinical service (11). In telehealth telecommunication devices are used to provide medical care outside the traditional face-to-face medical care. Telehealth includes the history taking, modified physical examination, diagnostic testing, assessment, and management for patient care from a distance using telecommunication technologies. Management of cases and follow up care using telehealth include behaviour change communication, medications, patient education , and shared decision making (12-15). Medical care and active decision-making may be provided through real -time interaction between the physician and patient or asynchronously using telehealth technologies (16).

 The significant changes in health care delivery are due the evolution of electronic communication. Even for basic care and monitoring of an elderly person with multiple chronic diseases adequate medical knowledge is required (17). Primary care physician may not have enough hours in the day to take care of a large number of patients (18). There is need of more efficient strategies for providing health care services in a resource limited settings. Modern communication technologies are used for telehealth services. The use of medical information and technologies for an advance clinical care from a distance has the potential to transform patient-centered care (19). Modern technologies enable us to communicate with patients through a multiple means of communication, including text, e-mail, and mobile-device applications. Telemedicine can integrate remote monitoring, automated interactions and reminders for better patient care from a distance (20). The technologies facilitate communications between members of the treatment care team. There are serious concerns about the impact health care with the adoption of telemedicine. The four possible downside of telemedicine are erosion of the patient-doctor relationship, threats to patient privacy, forcing one-size-fits-all implementations and the temptation to assume that new technology to be addressed (21).

1. **TELEHEALTH AND TELEMEDICINE**

TELEMEDICINE

 Telemedicine is a health-related services and information with the help of telecommunicating and electronic technologies. It refers to the whole collection of deliverables designed to enable patients and their physician or health care workers. It has a extended range of uses, like online patient consultations, remote control, telehealth nursing care, and remote physical and mental rehabilitation. It permit us better health care option , increases emergency service quality and production, reduces the time duration for making diagnosis, and saves costs for both physician and patients by optimising clinical procedures and reducing travel expenses to hospitals (22-23).

 Telemedicine has increased attainable to high quality healthcare facilities. Patients will now get more customized to health care services. They can also adjoin the best medical facilities by using video application software, consultations can be taken from afar, and clinicians have better-suited tools for networking, data storage, report management, and leveraging on each other’s specific skills. This improves the quality of medical practice, allowing physician to spend minimum time on rural allocation and providing more care to patients. Telemedicine also enables private healthcare specialists to practice and will enhance their patient experience, patients will no longer have to stand in long queues, and physicians will be able to access patient information more efficiently and conveniently with electronic files and get rid of overall wait times. Furthermore, remote appointments allow doctors to assign les time to each patient, allowing them to treat a more significant number of patients (23-25).

1. **TELECARE**

We use the definition of telecare used by Barlow et al., ‘the use of communications technology to provide health and social care directly to the user (patient). This excludes the exchange of information solely between professionals, generally for diagnosis or referral’. Telecare is therefore a tool used by professionals to deliver support to individuals and should be employed to provide a user-centred service that complements – rather than replaces – existing models of care.

1. **TELEHEALTH**

 Telehealth equipment is used as a tool in the management of long-term conditions in the community to proactively monitor patients and respond promptly to indicators of acute exacerbations. ‘Vital signs’ monitoring is believed to reduce hospital admissions and uses equipment in patients’ homes to identify trends and alert when preset parameters are breached.

Users are trained to operate a machine which measures physiological indices such as blood pressure, oxygen saturations, pulse rate and rhythm etc.

1. **TELEMEDICINE: HEALING AT A DISTANCE**

The WHO definition of telemedicine or e-health is ‘the practice of medical care using interactive audiovisual and data communications. This includes the delivery of medical care, diagnosis, consultation and treatment, as well as health education and the transfer of medical data’. The first recorded use of telemedicine was by Wilhelm Einthoven, inventor of the ECG. He experimented with transmitting early ECG recordings by telephone in 1906. Since then, telemedicine has become routine (26).

1. **ADVANTAGES OF TELEHEALTH**

 Using technology to deliver health care service has several advantages, including cost effective , comfort and convenience, and also ability to provide care to people with mobility limitations, or those in rural areas who don’t have access to a local physician or clinic. For these reasons, the use of telehealth has grown significantly over the last decade. The telemedicine can help to increase efficiency in the delivery of care by reducing waiting times and appointments. Telehealth has become even more essential during the coronavirus (COVID-19) pandemic. Fears of spreading and catching the virus during in-person medical visits have led to a greater interest in, and use of, technology to provide and receive health care.

1. **DISADVANTAGES TO TELEHEALTH**

 Telehealth offers a convenient and cost-effective way to see your doctor without having to leave your home, but it does have a few downsides.

* It isn’t possible to do every type of visit remotely. You still have to go into the office for things like imaging test and blood work, as well as for diagnoses that require a more hands-on approach.
* The security of personal health data transmitted electronically is a concern.
* While insurance companies are increasingly covering the cost of telehealth visits during the COVID-19 pandemic, some services may not be fully covered, leading to out-of-pocket costs.
* Limited evidence. There is limited evidence to support the efficiency of telemedicine (27).
1. **NEED OF TELEHEALTH IN TODAY’S WORLD**

 Hard to reach and remote areas exist in almost every country. In addition to this poor transport network and poor health care infrastructure and inadequate number of trained health care service providers are challenges for health care delivery to individuals in many parts of the world. Individuals with poor socioeconomic background are unable to bear the cost of transportation to the health facilities. Challenges in health care are due to variations in environment, economic capability, infrastructures, human resources etc. The burdens of chronic non communicable diseases are increasing day by day with improved life span. The travel to a health facility is difficult for a patient with immobility due to various medical conditions and there is lack of trained health care providers in the nearby health facility in many areas of a country. Astronauts, ship passengers, air passengers etc. often need telehealth services. Frequent visits are required for many chronic diseases which not possible for the patients. Based on report or parameters of these patients treatment can be modified using telehealth technologies. In case of infectious diseases there is risk transmission of diseases to the treating physicians, nurses and other service providers in the Hospital. There is also risk of transmission to the other patients attending health facility. Telehealth can provide faster, efficient and cheaper health care to the patients. The service providers including professionals and students can have instant access to knowledge and skills for better management of cases using telehealth technologies.

 Telemedicine can improve access to care and physicians in geographic areas with limited facilities in terms of infrastructure and trained service providers. Individuals are more comfortable with electronic communication and with raising dependence on investigation for diagnosis and moreover not touching a patient for diagnosis is considered as normal by most of the individuals. (28).

 Physicians may use telemedicine to build support networks to exchange their skills and provide better healthcare services to individuals. Telehealth technology has several advantages for both patients and healthcare providers. (25, 29-31).

 Telehealth has the potential to address many challenges to the primary health care (PHC) delivery system for the health and wellbeing of the community. These are related to accessibility, accountability, cost, quality, information exchange and utilization of services. (32). Telemedicine should still be used as a supplement to live visits and only for that patient with whom the practitioner has a pre-existing relationship was suggested by American Medical Association (33).

1. **TELEHEALTH TOOLS AND TECHNOLOGIES**

 The major goal of telemedicine today are to develop next-generation telehealth tools and technologies to enhance healthcare delivery to medically under-resource populations using telecommunication technology, to increase access to medical speciality services while decreasing healthcare costs, and to provide training of healthcare workers, clinical trainees, and students in health-related fields. Key drivers for these tools and technologies are the need and interest to collaborate among telehealth stakeholders, including patients, patient communities, researchers funders, researchers, healthcare service providers, professional societies, industry, healthcare management/economists, and healthcare policy makers. In the development, marketing, adoption, and implementation of these tools and technologies, communication, training, cultural sensitivity, and end-user customization are critical pieces to the process.

 With all the telehealth tools for clinicians, it becomes difficult to decide which is most valuable for the health care facility needs. A list of the most beneficial tools for clinicians at any size practice or health care facility or organization:

**A. Online patient portals**

 These telehealth tools for clinicians enable patients to access their secure personal health history and reach out to providers 24 X 7. No more searches for office hours is required for a doctor’s multiple locations, or waiting for a return call about a basic care plan question. Patient portals allow patients to:

* Request specialist referrals
* Schedule non-urgent appointments
* Refill prescriptions
* Access test results
* Read their telehealth visit summaries
* Reference their medical history
* Learn from patient education libraries
* Understand their insurance or Medicare benefits
* Update insurance or contact information
* Pay their providers

 When it’s time for a follow-up appointment, vaccination, or prescription refill, these portals can also send automated reminders via text or email—a critical service for busy or forgetful patient populations.

**B. Patient Relationship Management platforms**

 Convenient, effective telehealth tools for clinicians are so important to patients that they may be willing to switch providers in order to get it. Therefore, if you’re trying to maintain your current patients and attract new ones all while improving care delivery, consider implementing a Patient Relationship Management platform. Managing team’s workflow and enhancing reporting systems should not require juggling spreadsheets, CRMs (customer relationship management), and EHRs(electronic health record)—which can cause clinicians to misplace patient data, miscommunicate instructions, or miss clues that a patient is becoming disengaged.

 Patient Relationship Management platforms allow health care provider to tie their tools together, including telehealth technology tools, to allow the organization to scale without having to figure out how to restore fragmented records. They provide a 360-degree view of a patient’s health history—for all stakeholders. When primary care physicians, specialists, physical therapists, and mental health practitioners are all on the same page and regularly checking in with each other, quality of care improves and patient relationships thrive.

**C. Quality webcams**

 With telehealth becoming the norm for many patient populations, clinicians are expected to deliver a professional online experience as close to a live office visit as possible. We are to make sure the health facility; webcams offer high-quality video with a simple setup. One should be able to plug it into any available USB port on a laptop, desktop, or mobile phone that has Windows, Mac OS, Chrome, or Android. The camera should be mounted to a tripod for more intimate interactions. It should be designed to work with Skype, Google Hangouts, and Face Time for Mac—whatever platform the patient is most comfortable with. A good deal of research is to be done to ensure the web camera provides premium technical performance, user-friendly design, and operational ease in any collaborative environment. Video conference infect the most common means of telehealth services.

**D. Quality microphone**

 Next-generation conferencing platforms, network-based cameras, and quality microphones are all highly valuable tools for clinicians. They make it possible to install collaboration systems in hospital rooms and doctor’s offices to facilitate more efficient telehealth visits. An array of microphones can be installed permanently either in a room or on roll-in carts. Make sure they feature a long pick up range—approximately 30 feet—which enables voice capture of patients as well as all clinicians in the room. One can also invest in systems that extract voice input from ambient noise via telephones, speech recognition systems, or hearing aids. Surround sound produces a crisp, intimate listening experience. Other technologies automatically steer a “listening beam” to the active talker, reducing background noise.

**E. Reliable internet connection**

 The most critical aspect of any successful telehealth visit is a secure broadband internet connection. The speed of your internet connection will determine the video quality and the speed of data transfer. A basic business broadband connection—at about 50-100 megabits per second—should be sufficient. Next-generation tools and technologies are the means toward personalized medicine, extending the telemedicine model to include cell phones and Internet-based telecommunications tools for remote and home health management with video assessment, remote bedside monitoring, and patient-specific care tools with event logs, patient electronic profile, and physician note-writing capability. Telehealth is ultimately a system of systems in scale and complexity. The right tools ensure that both providers and patients are getting the most out of a fully realized telehealth implementation (34).

1. **ROLE OF TELEHEALTH IN HEALTHCARE**

 Rural health is especially difficult to come by, as access to healthcare providers is much more limited than it is in urban areas. Moreover rural population is economically weaker to go faraway places and seek better treatment which sometimes leads to loss of property to meet the travelling cost itself. Poverty can impede a patient’s ability to show up to important office visits and consultations. If a person can’t afford to take time off from work, they may never be able to get treatment for their injury or illness. Lack of health insurance is enough to keep people from visiting a healthcare provider altogether—incredibly high medical bills could put them in debt. So telehealth is the only solution until the health infrastructure reaches their doorstep. [Telehealth](https://welkinhealth.com/product/telehealth/) can bridge the remote delivery of healthcare services—including medical information and healthcare education—via telecommunications systems.

 If a health care provider has to come to a remote place he will have to bear travelling cost, staying cost and the visiting cost also likewise increases. On the other hand Real-time video conferencing is significantly cheaper than in-person visits—for both patient and provider. Because it is an extremely cost-effective solution, telehealth is a wonderful alternative to in-office care when addressing the social determinants of health.

#### Healthcare provider benefits

 While every healthcare provider’s primary goal is to deliver high-quality care, there are a lot of administrative tasks that siphon some of their focus and energy. Telehealth technologies enable care teams to increase workflow efficiency so that they can focus on improving their patients’ health.

* **Higher efficiency:** Telehealth technologies drastically improve workflow and streamline efficiency across care teams. Telecommunications systems that feature automated messaging, comprehensive patient databases, and virtual consultations allow providers to spend time productively and reach more patients.
* **Lower costs:**  telehealth systems are inexpensive to implement and virtual visits are vastly cheaper than traditional office visits.
* **Easier scalability:** As the practice grows, one should be able to grow with it without sacrificing quality of care. Using telehealth technologies allows a clinician to automate clinical services—appointment reminders, office visit follow-up calls, billing, and prescription ordering—as you expand your healthcare services and take on more patients.
* **Higher revenue:** Implementing telehealth technologies will increase your practice’s profits. Healthcare systems that implement this solution reduce overhead costs, decrease appointment times, and improve workflows to save valuable time and funds.

 Telemedicine offers a massive opportunity to drastically improve the way care teams provide patient-centered healthcare. Regardless of a patient’s condition or circumstance, there is bound to be a digital healthcare tool out there that can help them better manage their symptoms.

#### Telehealth technologies for addiction

 The management of treatment for substance misuse takes frequent check-ins and communication through a variety of channels. Telehealth technologies offer people struggling with addiction more accessibility to their coach or therapist. Increasing access to your care team through a customized telecommunications system—including video conferencing, as well as smartphone texts, chats, and emails—helps you better support patients who are recovering from addiction and, subsequently, increases positive outcomes. Ongoing management can lead to improved health and happiness, enabling these individuals to regain control over their lives.

#### Telehealth technologies for behavioral health

 Telehealth addresses the issue of maldistribution among behavioural health providers in the U.S. Around 43.8 million American adults experience a type of mental illness in any given year—and yet; nearly 60% don’t receive proper mental health services. Many factors can hinder an individual’s ability to receive behavioral health services—including location, lack of anonymity, or simply the stigma that sometimes accompanies mental healthcare. Delivering healthcare services via telehealth technologies—such as with video conferencing and patient portals—helps patients get the care they need, when they need it.

#### Telehealth technologies for diabetes

 Care teams coaching people through diabetes can help them lead healthy, normal lives—but they need to educate these patients on how to self-manage their chronic disease most effectively. Telehealth allows healthcare providers to meet with patients who might not be able to come into the health system facility as frequently as they need. This can be incredibly helpful for diabetes patients living in rural areas who must commute into larger cities in order to meet with specialists—like endocrinologists and nutritionists. Real-time telemedicine appointments via video conferencing or smartphone can save patients time and relieve them of the stress that comes with commuting long distances for a single office visit.

 Telehealth technologies allow clinicians to take virtual care a step further by well-monitoring their patient’s glucose levels. Wearable devices—for instance, insulin pumps and continuous glucose monitors—apply digital technology to help patients with diabetes easily track and adjust their blood glucose levels. This can empower them to absorb the medical information they need to effectively self-manage their chronic illness and live healthier lives.

#### Telehealth technologies for home health

 Remote patient monitoring and virtual visits allow care teams to connect with their patients [at home](https://welkinhealth.com/solutions/home-health/) and continue care online. Managing an injury or illness can take a lot of check-ins and patient-provider communication. Telehealth technologies allow healthcare providers to check in with patients between visits. Implementing healthcare processes that utilize these services can even reduce the rate of hospital readmissions and emergency department visits. A 2016 study revealed that remote patient monitoring of vital signs using wireless peripherals reduced patient readmission rates by 5.2% over 30 days,   and by 14% over three years. While technology is by no means a replacement for home health, it does complement at-home care by making it more convenient to detect problems as they arise and help your patients when they are in need.

#### Telehealth technologies for hospice

 When it comes to hospice care, telehealth can be utilized for patients receiving care at home. Remote patient monitoring (RPM) allows healthcare providers to track patients’ biometrics from afar. RPM will not only increase timely response and intervention as a patient’s condition changes, but also eliminate the burden of travel to an office visit, urgent care clinic, or emergency department for patients and their families. This virtual connection and remote patient monitoring bring peace of mind for the patient, the family, and the healthcare providers.

#### Telehealth technologies for hypertension

 Remote patient monitoring helps hypertension patients improve their blood pressure numbers by learning better control. When used regularly, home blood pressure telemonitoring (HBPT) may result in a significant BP reduction, improving the person’s quality of life and independence. HBPT is a great tool for patients who have a large network of healthcare providers—including doctors, nurses, pharmacists, nutritionists, and acupuncturists—that are collaborating to help manage comorbidities and hypertension. When executed well, this approach even has the potential to result in the prevention of cardiovascular disease.

#### Telehealth technologies for musculoskeletal disorders

 Recent studies have shown that real-time tele-rehabilitation services for musculoskeletal disorders are “effective and comparable” to standard practice. Video conferencing consultations can be used to replace or supplement in-person care as a means to reduce the cost and time associated with office visits. This can prevent patients from having to leave work in order to attend appointments and from traveling more than is comfortable—or possible.

#### Telehealth technologies for value-based care

 Telehealth solutions empower care teams to deliver value-based care. Virtual visits, smartphone consultations, and other real-time telemedicine make it convenient for patients to receive quality care—without leaving their home or workplace. Whether a team treats patients with chronic illnesses that make going out difficult, or patients who live in rural areas and have lengthy commutes to the nearest healthcare system office, telehealth makes your services more accessible. Similarly, software programs that include telehealth technologies like RPM (remote patient monitoring) ensure that crucial patient-generated medical information and lab results are available to every healthcare provider that treats a patient. Teams can streamline care between clinicians and across practices to make sure each patient is receiving whole-person care.

 Increasing healthcare costs and a need for efficient treatment are motivating more hospitals to investigate the benefits of telemedicine. They want improved contact between physicians and far-off patients and better usage of healthcare facilities. Here telemedicine also promotes better connectivity, which has resulted in fewer hospital re-admissions and patients entirely adhering to their prescription care plans. Telemedicine’s increased contact advantage extends to doctor-to-doctor communication as well. Physician may use telemedicine to build support networks to interchange their skills and provide better healthcare services. Telemedicine is a way of delivering medical treatment through video chat. Telemedicine has several advantages for both patients and healthcare providers. Though there are still technical hurdles and critics, telemedicine can supplement and enhance the overall patient experience (25, 29-31).

1. **LIMITATIONS OF TELEHEALTH**

 Overall, end-user adoption is challenged by the need for the integration of new technologies in clinical practice workflow and daily activities. Adoption requires cultural and behavioural changes for use and reliance on telehealth technologies. The lack of standard metrics for quality of service assessment obstruct the evaluation and mysterious the progress of technology adoption and utility. (35-36). From the patient’s perspective, the usability and ease-of-access to technologies are obstructed by the lack of technology integration, connectivity, and standardization. For example, though telecommunication vendors and vendor resources could provide low-cost solutions as data are transmitted through their omnipresent networks, they might also limit expansion of applications and affordability for cell phone text and data transmission for economic reasons (37). From the providers’ perspective, there is limited time available to respond to the multitude of telecommunications from patients and to enter data into HER/EMR systems. A pervasive barrier for these end-users to secure new tools and technologies is the limited financing available for implementation, maintenance, and sustainability (34, 36-39).

 When compared to conventional treatment approaches, telemedicine has lots of feasible drawbacks to using telemedicine. It is no substitute for the conventional healthcare system; it complements the healthcare system for minimal functions. There is a serious issue of hacking patient’s medical data, especially if the patient connects to telemedicine from a public network or an unencrypted channel. In this technology can cause the medication to be delayed when a person requires emergency care, mainly because a doctor cannot deliver life-saving care or laboratory tests remotely. State rules differ, and physicians will be unable to practise medicine across state boundaries based on the state in which they are licenced and the state in which the patient resides. Clinicians must also ensure that the telemedicine service they use is safe and severe and compliant with privacy laws.

During telemedicine sessions, providers must focus on patient self-reports and necessitate physicians asking further questions to get a complete patient history. If a patient fails to report an important symptom that should have been detected during in-person care, medication could be jeopardised. One of the most significant drawbacks being lack of availability and affordability. It can be costly for the supplier to set up and manage. Telemedicine can be prohibitively expensive for smaller healthcare facilities though a valuable and worthwhile facilities. Poor communication will also make it impossible to provide reliable care (25).

1. **ETHICAL IISUES IN TELEHEALTH**

 In telehealth, the information of the patient is available on various devices and computers, which increases the potential for security breaches. Patient is unaware of who will be responding and sharing their personal medical information’s. There is involvement of various disciplines and problem may involve from these various disciplines – like Bioengineers, computer experts, software technicians, web programmers, insurance providers, physicians and nurses. The patients should be informed of the limitations and functionality of telemedicine services. Provision of obtaining informed consent should be available from the patient and there should be option to avail or refuse telemedicine visits opportunity by the patients, to ensure that the patients are not forced into unwanted modes of healthcare delivery (40, 41).

 Telehealth, has raised issues like conflicts between various aspects of technology usage, security breaches, inaccurate and obsolete data, information overload; usability and user-friendliness; data standards and integration for linking patient and personal information to achieve interoperability for individual records, personal health management, and public health. The quality and accuracy of online information also is of deep concern. Patient autonomy should also be respected regardless of the mode of delivery (42- 44).

1. **LOOKING FORWARD**

 Telehealth saw a surged in its use during COVID-19 pandemic. Although there is limitations and drawbacks of telehealth, the proper development and implementation of telemedicine with various updated technical telehealth app and Smartphone will be helpful for the patients in respect to cost effective for selective conditions like follow up and non-emergency conditions, schedule appointments, access to medical records, physician directories, etc. Newer technology should ensure patients confidentiality.

 In future, patient can schedule an appointment with the physician of their choice, upload medical history, verification documents, investigations reports and past prescriptions. The patient interfaces functioning properly allow the doctor to overview the Patient’s physical & personal records and outline an urgent care plan. Local healthcare resources can be mobilized for emergent and non-emergent services. This will allow the physicians to handle low level, non-emergent conditions to handle remotely and concentrate more on high-demand and complicated cases in person (25). Telehealth bridges the gap between a patient and provider, creating a new avenue to experience better. The future of telemedicine will depend on human factors, economics and technology (45).

1. **CONCLUSION:**

 The telemedicine and telehealth services have taken a surge in its use, during COVID-19 pandemic. Telemedicine is a valuable technology, where a patient from a remote area can take the benefit of medical care by the physician, in absence of a local doctor or clinics. Although it has limitations, like emergencies, surgeries and lab investigations, inability to do direct physical examinations, but telemedicine is beneficial to both patients and physicians in respect to economy, health care services, convenience with the use of telehealth technology tools (information technologies, online patient portals, videoconferencing, Smartphone apps, etc). Local healthcare resources can be mobilized from emergent and non-emergent services. This will allow the physicians to handle low level, non-emergent conditions be telemedicine remotely and can concentrate more on high-level and complicated cases physically in person. Newer and updated telehealth tools and technologies that utilize the internet and its robust computational resources have great promise in improving healthcare services for medically underserved populations, in relation to economics, and delivering medical services and education and training.

**REFERENCES:**

1. Oh H, Rizo C, Enkin M, Jadad A, Powell J, Pagliari C. What is eHealth (3): a systematic review of published definitions. *J Med Internet Res*. 2005;7(1):e1. <https://doi.org/10.2196/jmir.7.1.e1>.
2. eHealth: Digital health and care. https://health.ec.europa.eu>overview. Accessed on 30th July, 2023.
3. Aronson SH, Mackenzie C, Bell AG. The lancet on the telephone 1876-1975. *Med Hist*.1977;21:69–87.
4. Bashshur RL, Shannon GW. *History of Telemedicine*. Mary Ann Liebert; 2009. ISBN 13 978-1-934854-11-2, ISBN e-book 978-1-934854-04-2.
5. Gupta RRR, Mitra M, Bera J. *ECG Acquisition and Automated Remote Processing*. Springer; 2014: pp. 214. ISBN: 8132215575.
6. Craig Standing1 \*, Susan Standing1 , Marie-Louise McDermott1 , Raj Gururajan2 and Reza KianiMarvi. The Paradoxes of Telehealth: a Review of the Literature 2000–2015.Systems Research and Behavioral Science Syst. Res (2016) Published online in Wiley Online Library (wileyonlinelibrary.com) DOI: 10.1002/sres.2442.
7. Cranford, L., 2020, May 1. Telemedicine Vs telehealth: What’s the Difference. Chiron <https://chironhealth.com/blog/telemedicine-vs-telehealth-whats-the-difference/>
8. Siwicki, B., 2020, March 19. Telemedicine During COVID-19: Benefits, limitations, burdens, Adaptation. Healthcare IT News <https://www.healthcareitnews.com/news/telemedicine-during-covid-19-benefits-limitations-burdens-adaptation>.
9. Smrke, A., Younger, E., Wilson, R., Husson, O., Farag, S., Merry, E., Macklin-Doherty, A., Cojocaru, E., Arthur, A., Benson, C., Miah, A.B., Zaidi, S., Gannata, S., Jones, R.L., 2020. Telemedicine during COVID-19 pandemic: impact on care for rare cancers. JCO Global Oncology 6 10-46-1051https://doi.org/10. 1200/GO.20.00220
10. Centers for Disease Control and Prevention [CDC]. (2020, July 16). Cases in the US. <https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/cases-in-us.html>.
11. HRSA. Telehealth November 2015. Available at <http://www.hrsa.gov.ruralhealth/telehealth/>. Accessed on 30th July,2023.
12. G.A. Brenes, S.C.Danhauer, M.F. Lyles, P.E.Hogan, M.E. Miller. Telephone-delivered cognitive behavioural therapy and telephone-delivered nondirective supportive therapy for rural older adults with generalized anxiety disorder: A randomized clinical trial. JAMA Psychiatry.2015;72:1012-1020.
13. M. Dharmar, N. Kuppermann, P.S. Romano, et al. Telemedicine consultations and medication errors in rural emergency departments. Pediatrics.2013;132:1090-1097
14. L.E. Steffen, K.M. Boucher, B.H. Damron, et al. Efficacy of a telehealth intervention on colonoscopy uptake when cost is a barrier: The Family CARE Cluster Randomized Controlled Trial. Cancer Epidemiol Biomarkers Prev.2015;24:1311-1318.
15. D.Veroff, A. Marr, D.E. Wennberg. Enhanced support for shared decision making reduced costs of care for patients with preference-sensitive conditions. Health Aff (Millwood).2013; 32:285-293.
16. Adam S. Tenforde MD, Jaye E. Hefner MD, Jodi E. Kodish-Wachs MD , Mary A. Iaccarino MD, Sabrina Paganoni .Telehealth in Physical Medicine and Rehabilitation: A Narrative Review. [PM&R](https://www.sciencedirect.com/journal/pm-and-r). [Volume 9, Issue 5, Supplement](https://www.sciencedirect.com/journal/pm-and-r/vol/9/issue/5/suppl/S), May 2017, Pages S51-S58
17. Smith R. What clinical information do doctors need? *BMJ*. 1996;313(7064):1062-1068.
18. Yarnall KS, Pollak KI, Østbye T, Krause KM, Michener JL. Primary care: is there enough time for prevention? *Am J Public Health*. 2003;93(4):635-641).
19. American Telemedicine Association. What is telemedicine? http://www.americantelemed.org/about-telemedicine/what-is-telemedicine. Accessed September 4, 2014.
20. Asch DA, Muller RW, Volpp KG. Automated hovering in health care—watching over the 5000 hours. *N Engl J Med*. 2012;367(1):1-3)
21. Mehta SJ. Telemedicine’s Potential Ethical Pitfalls. Medicine and society. Dec 2014; 16(12):1014-1017. Doi:10.1001/virtualmentor.2014.16.12.msoc1-1412.. Virtual mentor
22. R.S. Weinstein, A.M. Lopez, B.A. Joseph, K.A. Erps, M. Holcomb, G.P. Barker,

 E.A. Krupinski, Telemedicine, telehealth, and mobile health applications that work: opportunities and barriers, Am. J. Med. 127 (3) (2014 Mar 1) 183–187.

 23. E. Parimbelli, B. Bottalico, E. Losiouk, M. Tomasi, A. Santosuosso, G. Lanzola, S. Quaglini, R. Bellazzi, Trusting telemedicine: a discussion on risks, safety, legal implications and liability of involved stakeholders, Int. J. Med. Inf. 112 (2018 Apr

1. 90–98.
2. X. Wang, Z. Zhang, J. Zhao, Y. Shi, Impact of telemedicine on healthcare service system considering patients' choice, Discrete Dynam Nat. Soc. (2019 Jan 1), 2019.
3. Haleem A, Javaid M, Singh RP, Suman R. Telemedicine for healthcare: capabilities, features, barriers, and applications. Sens Int. 2021;2:100117. Doi: 10.1016/sintl.2021.100117. Epub 2021 Jul 24. PMID:34806053; PMCID: PMC8590973.
4. Stowe S., Harding S. Telecare, telehealth and telemedicine. European Geriatric Medicine. Volume 1 (3), June 2010 Pg 193 – 197).
5. Telehealth: The advantages and disadvantages, Oct 12, 2020. By Stephaine Watson. Former Executive Editor, Harvard Women’s Health Watch. (Blog)
6. Mehta SJ. Telemedicine’s Potential Ethical Pitfalls. Medicine and society. Dec 2014; 16(12):1014-1017. Doi:10.1001/virtualmentor.2014.16.12.msoc1-1412.. Virtual mentor.)
7. A.S. Albahri, J.K. Alwan, Z.K. Taha, S.F. Ismail, R.A. Alsalem, A.A. Zaidan, O.S.Albahri, B.B. Zaidan, A.H. Alamoodi, M.A. Alsalem, IOT-based telemedicine for disease prevention and health promotion: State of the Art, J. Newtw.Comput.Appl.173 (2021 Jan 1),102873.
8. R.L. Bashshur, G.W. Shannon, E.A. Krupinski, J. Grigsby, J.C. Kvedar, R.S. Weinstein, J.H. Sanders, K.S.Rheuban, T.S. Nesbitt, D.C. Alverson, R.C. Merrel, National Telemedicine initiatives: Essential to Healthcare reform, Telemedicine and e-health 15 (6) (2009 Jul 1) 600-610.
9. S. Manchanda, Telemedicine –getting care to patients closer to home, Am. J. Respir. Crit. Care Med. 201 (12) (2020 Jun 15) P26-p27.
10. Leveraging telehealth for efficient delivery of primary health care in the WHO South-East Asia Region (October 2021), https://apps.who.int>iris>handle. Accessed on 30th July 2023.
11. AMA adopts telemedicine policy to improve access to care for patients [news release]. Chicago, IL: American Medical Association; June 11, 2014. http://www.ama-assn.org/ama/pub/news/news/2014/2014-06-11-policy-coverage-reimbursement-for-telemedicine.page. Accessed September 5, 2014.
12. Ackerman MJ, Filart R, Burgess LP, Lee I, Poropatich RK. Developing next-generation telehealth tools and technologies: patients, systems, and data perspectives. Telemed J E Health. 2010 Jan-Feb; 16(1):93-5. DOI:10.1089/tmj.2009.0153. PMID:20043711;PMCID:PMC299305.
13. Fjeldsoe BS, Marshall AL, Miller YD. Behavior change interventions delivered by mobile telephone short message service. Am J Prev Med 2009;36:165–173., National Coordination Office for Networking and Information Technology Research and Development, Networking and Information Technology Research and Development Program, High Confidence Software and Systems Coordinating Group. High-confidence medical devices: Cyber physical systems for 21st century health care—A research and development needs report. Arlington, VA, February 2009.
14. Wright A, Sittig DF, Ash JS, Sharma S, Pang JE, Middleton B. Clinical decision support capabilities of commercially-available clinical information systems.J Am Med Inform Assoc 2009;16:637–644.
15. Lee I, Pappas G, Cleaveland R, Hatcliff J, Krogh B, Lee P, Rubin H, Sha L. High-confidence medical device software and systems. IEEE Computer 2006;39:33–38.
16. Gross PA, Bates DW. A pragmatic approach to implementing best practices for

clinical decision support systems in computerized provider order entry systems. J Am Med Inform Assoc 2007;14:25–28.

1. Haberman S, Feldman J, Merhi ZO, Markenson G, Cohen W, Minkoff H. Effect of

 clinical-decision support on documentation compliance in an electronic medical record. Obstet Gynecol 2009;114(2 Pt 1):311–317.

1. Ethical Practice in Telemedicine. [Jun;2020}; American Medical Association. (2020)

<https://www.ama-assn.org/delivering-care/ethics/ethical-practice-telemedicne> 2020

1. Telehealth. [Jun;2020]; Tuckson Tuckson, R.R., Edmunds Edmunds, M. and Hodgikins, MM. <https://www.nejm.org/doi/full/10.1056/NEJMsr1503323>. N Engl J Med. 2017 377:1585-1592.
2. Jin MX, Kim SY, Miller LJ, Behari G, Correa R. Telemedicine: Current Impact on the Furture. Cureus. 2020 Aug; 12(8): e9891. PMCID: PMC7502422 doi: 10.7759/cureus.9891
3. Bauer KA. Home-based telemedicine: A survey of ethical issues. Cambridge Quarterly of Health Care Ethics 2001;10:137-46; Layman E. Health informatics: Ethical issues. Health Care Manager 2003;22(1):2-15
4. Goodman KW. Bioethics and Health informatics: An introduction. In: Goodman KW, ed. Ethics, Computing, and Medicine: Informatics and the Transformation of Health Care. Cambridge: Cambridge University Press; 1998:1-31; Anderson JG, Goodman KW, eds. Ethics and Information Technology: A Case-Based Approach to a Health Care System in Transition. New York: Springer; 2002
5. Heinzelmann PJ, Lugn NE, Kvedar JC. Telemedicine in the future. J Telemed Telecare. 2005;11(8):384-90. doi: 10.1177/1357633X0501100802. PMID: 16356311.