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Telemedicine: Enhancing access and quality of care through digital health

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Abstract: it can streamline the workflow of hospitals and clinics. This disruptive technology would make monitoring discharged patients and managing their recovery easier. As a result, it is sufficient to state that telemedicine can create a win-win situation. This paper explores the significant capabilities and features of treatment workflow and the barriers to adopting telemedicine in healthcare. The paper identifies seventeen significant applications of telemedicine in Healthcare. Due to travel costs, regular hospital visits can be expensive, particularly in rural areas. In the era of the COVID-19 pandemic, where physical interaction becomes risky, people prefer telemedicine. Further, practitioners need file management and a payment gateway system. Telemedicine technologies allow patients and doctors to review the treatment process. However, this technology supplements physical consultation and is no substitute for a physical consultation.

History:
In the late 1800s and early 1900s, telemedicine emerged as a way to exchange information for diagnosing, treating, and preventing diseases and injuries, conducting research and evaluations, and providing continuous education to healthcare providers (World Health Organization; Strehle and Shabde, 2006). Unlike traditional face-to-face or telephone consultations, telemedicine, also known as virtual consultations, is gaining popularity. It enables the provision of remote medical care using specialized medical mobile apps or, more recently, video chat-capable apps such as WhatsApp, Skype, and FaceTime in certain countries (Armfield et al., 2015; Greenhalgh et al., 2016). In 1957, a Canadian doctor developed a teleradiology system in Montreal, through which radiographic images were transmitted from one hospital to another 5 miles away via coaxial cable. In the early 2000s, astronauts performed the first remote ultrasound scans with guidance from experts at the Mission Control Center (Sargsyan et al., 2005). These ultrasound systems provided high-definition sonographic imaging of cardiac, vascular, general, abdominal, thoracic, and musculoskeletal systems. Additionally, Abeille et al. (2003, 2005, 2007) developed and tested a robotic arm with a fixed echo graphic probe for use on a population located in rural areas. The system was used to diagnose various adult pathologies (gallbladder lithiasis, renal cavity distension, appendicitis, superficial and deep vessels) as well as in gynecology and fetal development.

1.1. "Introduction: Telehealth has the potential to improve the effectiveness, organization, and accessibility of healthcare. Although research in this area is still in its early stages, it is expanding. An example is the use of telephone-based care and telemonitoring of vital signs in individuals with heart disease, which has been shown to reduce the risk of mortality and hospitalization while improving quality of life. There are good reasons for individuals to seek a diagnosis or recovery plan, as this can provide reassurance that they are receiving high-quality treatment. Telemedicine has expanded the ability of healthcare providers to care for many individuals without being physically present. With proven benefits, telehealth is expected to continue to be a prominent feature of healthcare delivery. While the initial uptake of telehealth was driven by video conferencing, the ongoing evolution of telemedicine continues.

1.2. "What is telemedicine?

Telemedicine is a healthcare service that uses telecommunication and electronic information technologies to enable patients to connect with their physicians or healthcare providers remotely. It allows medical professionals to diagnose and treat patients from a distance and is associated with the necessary technological requirements for conducting telehealth. Some challenges may include a lack of broadband coverage or low bandwidth, a lack of user-friendly telehealth hardware or software, and poor digital literacy. Telemedicine allows patients to schedule virtual appointments with healthcare providers for routine check-ups, follow-up visits, or non-emergency medical issues. These virtual consultations enable real-time communication and interaction between patients and providers, leading to personalized care and improved patient engagement. Telemedicine networks also support IoT applications for accessing and transmitting medical data across various layers of the Cloud ecosystem.

1.3. Why healthcare system needs telemedicine?

Telemedicine specialties include tele-neurology, telepsychiatry, telepathology, and tele-pharmacy. The goals of telemedicine are to improve healthcare accessibility, reduce costs, enhance patient outcomes, provide healthcare in underserved areas, facilitate specialist consultations, and support medical education and research. (Source: 21 Dec 2023)2. The treatment workflow process being used in telemedicine care

It all starts with the patient's entry or detailed information, further followed by the telehealth supportive care unit. This step is further associated with the setting up of the doctoral assistant to the patient and then after the diagnosis and appropriate treatment offered to the person under utmost care

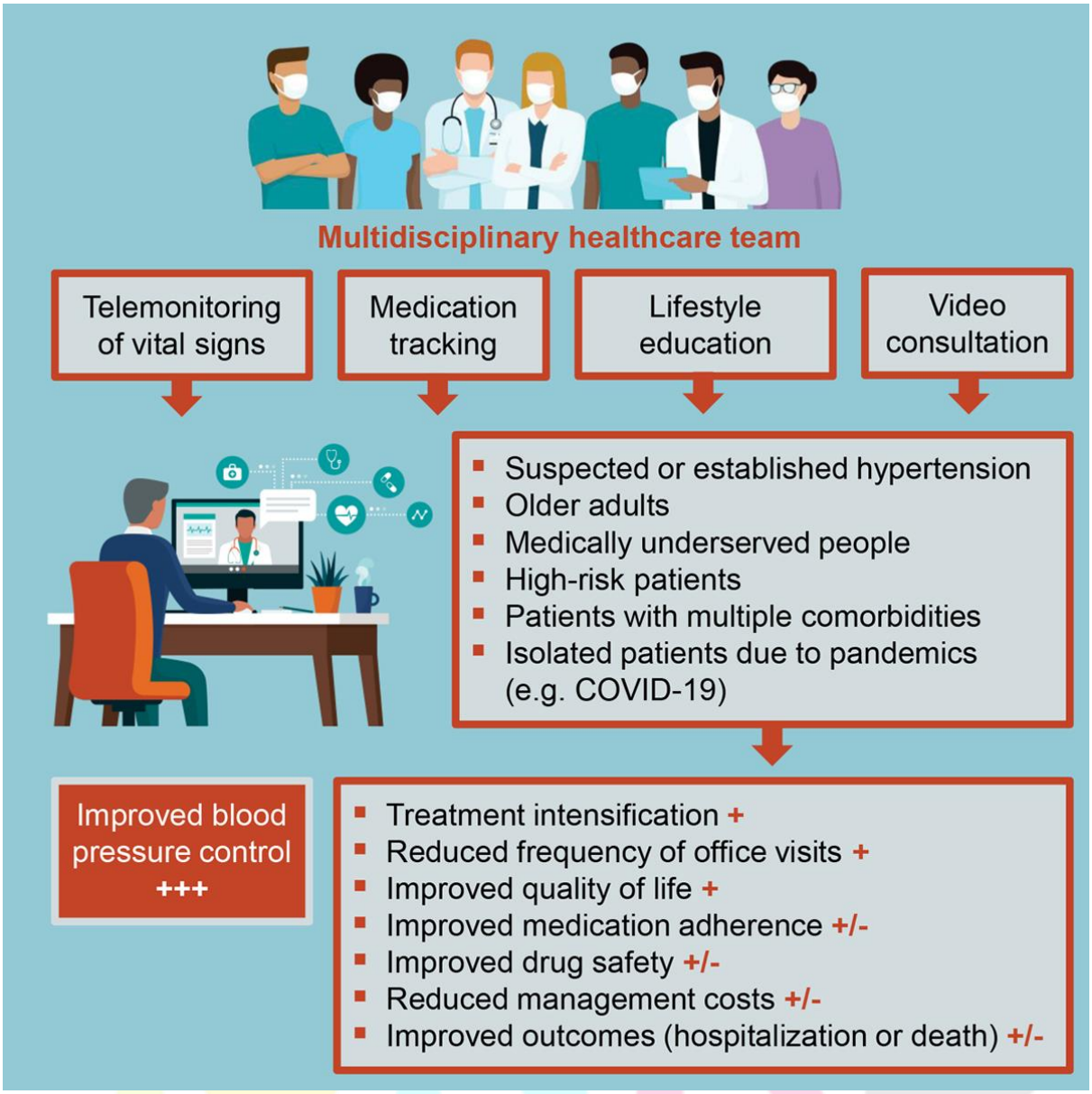

Fig.1

3. Capabilities and features of telemedicine when used in the healthcare management system

- Affordable Medical Services
- Quick and Efficient Healthcare Services
- Increase Efficiency and Agility
- Improved Patient Monitoring and Management
- Access to EHR.
- Remote Access
- Data and User Security.
- HIPAA and GDPR Compliance

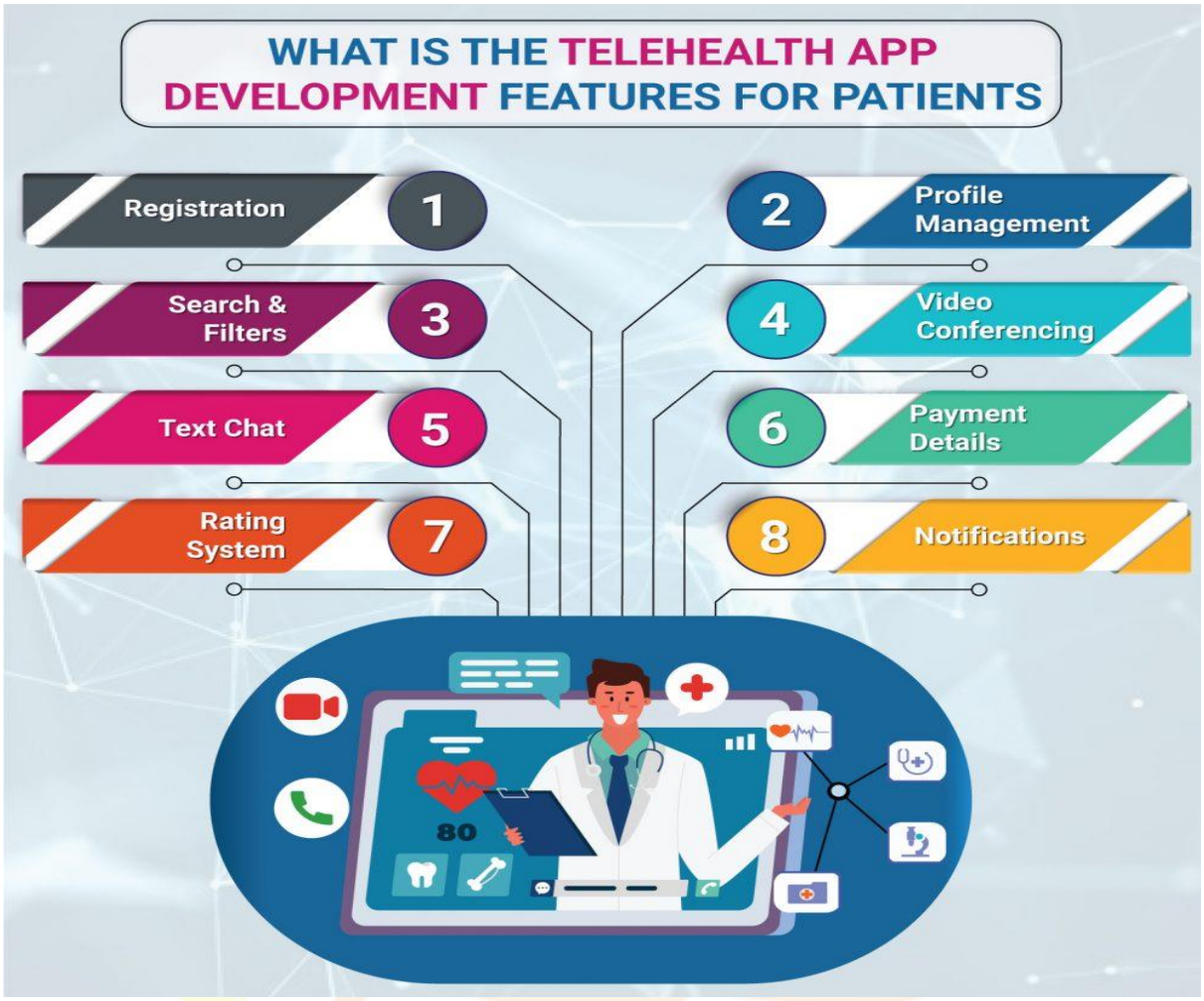

Fig.2

4. Barriers to the adoption of Telemedicine practices in making healthcare services effective

These are usually associated with the technological requirements for conducting telehealth. They may include a lack of broadband coverage or low bandwidth, a lack of user-friendly telehealth hardware or software, and poor digital literacy. These barriers include lack of infrastructure, cost, technical sophistication, lack of skilled human resources, and lack of e-readiness of medical professionals

- Ethical barriers
- Economical barriers
- Regulatory barriers
- Socio-cultural barriers
- Technological barriers

5. Telemedicine in healthcare: significant application areas

- Reduce healthcare costs
- Enhance patient outcomes
- Provide healthcare in underserved areas
- Facilitate specialist consultations
- Support medical education and research

6. Limitations of telemedicine in healthcare

- Patients can be monitored remotely, obtain their health data, learn about their health, and get more information on their health. In this way, telemedicine can improve continuity of care via remote patient monitoring and timely interventions.
- Physical limitations. Telehealth supports patients with physical limitations, visual or hearing impairments, or those facing isolation by bridging geographical and physical barriers. Patients also don't have to choose between essential daily needs and getting behavioral health care.
- Prescribing medications. Mental health providers often prescribe controlled and non-controlled medications. Before COVID-19, controlled substance prescribing via telemedicine was difficult to do, with most states requiring in-person visits. However, the extension of the temporary flexibilities allows DEA-registered practitioners to continue prescribing some controlled medications.

During telemedicine sessions, it is essential for providers to focus on patient self-reports and ask additional questions to obtain a complete patient history. If a patient fails to report an important symptom that should have been detected during an in-person visit, it could jeopardize their medication. One significant drawback is the lack of availability and affordability; setting up and managing telemedicine can be costly for healthcare facilities, especially for smaller ones. Poor communication can also hinder reliable care.

In emergencies, telemedicine may cause delays in medication or life-saving care, as doctors cannot provide immediate in-person assistance or conduct laboratory tests remotely. Additionally, different state rules may restrict physicians from practicing medicine across state boundaries, based on their licensure and the patient's location. Clinicians must also ensure that the telemedicine service they use complies with privacy laws and is safe and secure.7. Methods
The search strategy included articles that were published during the last ten years (from January 2014 to March 2024). The search strategy included the following keywords: pain management, telemedicine in pain management, and digital health in pain management. The selected articles were screened by two independent reviewers using the same method of evaluation. The final reviewing strategy of the literature search results in a total of 38 articles
The different methods of Telehealth are:

1. Live video conferencing
2. Asynchronous Video (also known as Store-and-Forward)
3. Remote Patient Monitoring (RPM)
4. Mobile Health (mHealth)

Today, we are experiencing a new paradigm in the management of the physician-patient relationship due to advances in technology, shortage of medical care in remote areas, and increasing demands for healthcare in communities. Telehealth and telemedicine are becoming integral to future healthcare and well-being.

Telehealth involves the use of information and communication technology to support health in remote locations, including long-distance medical care, health education for patients and professionals, and preventive measures. On the other hand, telemedicine utilizes information technology to provide real-time medical care, such as consultations with doctors via platforms like Skype, remote telesurgery, and telecardiology. Were included in this review.

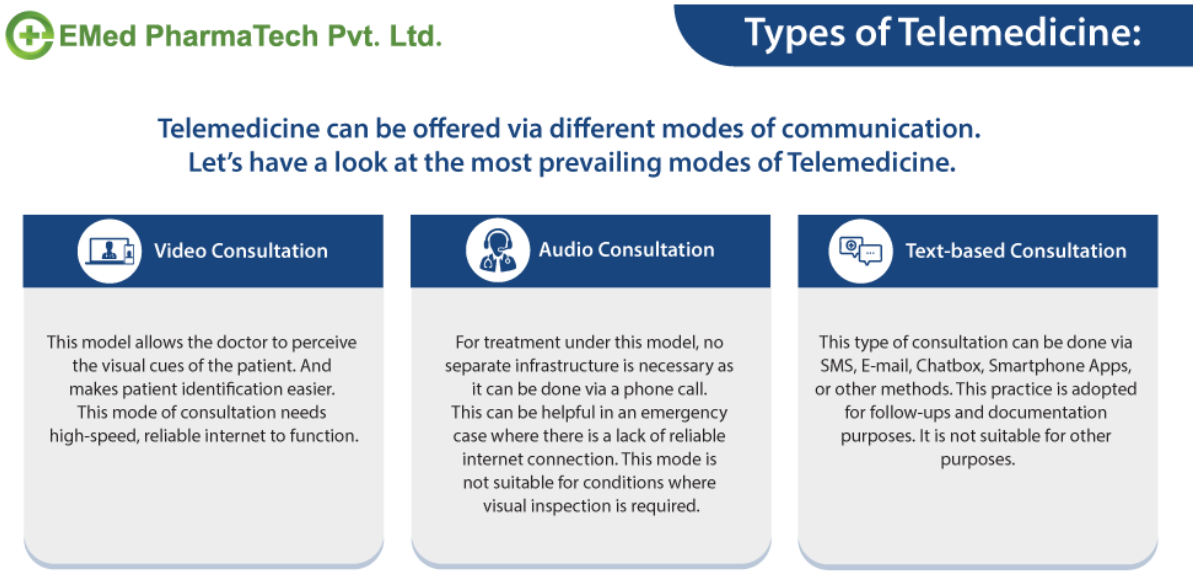

Fig.3
8. Modes of Telemedicine and Digital Health
People in low- or middle-income countries, especially those affected by war, have disproportionately high mental health burdens exacerbated by inadequate mental healthcare. Afghanistan has shown the value of telehealth programs using mobile phones, such as public health initiatives to reduce stigma. Other low- or middle-income countries may follow Afghanistan's approach. As mobile phones become more common, e-health or digital health, which allows people to access mental health information online, has significance for all of the world's nations. People frequently use digital platforms to find information on mental illness; thus, non-profit organizations, free helplines, and digital educational initiatives should all continue to get international support. Because there may be a sense of urgency, acute sickness should ideally be evaluated by a licensed healthcare professional in person. When the patient's history and physical exam can be completed "locally" and the results are electronically transmitted to a remote consultant, telemedicine has been proven to be effective in an urgent medical scenario
9. Scope of the Services by Tele-Technology
The scope of telemedicine includes many aspects. Tele-technology services differ according to the clinical situation, resources, and patient level of education. It can be used to triage the cases according to the urgency of the medical condition, or according to the risk of infection. Also, it can be used to evaluate a patient's medical condition, assess pain, plan the treatment of chronic pain, and prescribe and refill pain medications including opioids. Additionally, telemedicine can be used to offer patient education, treat the emotional distress of patients with chronic pain, and perform a bio-psychosocial management of pain
10. Need for telemedicine
Telemedicine utilizes emerging networking systems, application software for communication, and advanced devices such as computers and mobile devices to view and control healthcare facilities for medical reports, appointments, prescription refills, payments, and contacting doctors. It can be used as an online patient portal. Forward-thinking schools partner with doctors to conduct school-based remote visits. The provider may evaluate the situation and provide parents with instructions or reassurance. Telemedicine technology has also been successful in keeping residents in assisted living facilities out of the hospital. On-call physicians may use telemedicine to decide if hospitalization is necessary at remotely located clinics. There are now several

telehealth options available to assist in managing healthcare and receiving treatments. Telemedicine is categorized into three main purposes: 1. Doctor to doctor: for medical consultations 2. Nurse to doctor: for medical consultations 3. Patient to doctor: for Direct Patient Care (DPC) These classifications are recognized by legal systems around the world, except for Direct Patient Care (DPC), which is not generally allowed. However, there are ongoing efforts to legalize it globally. The text also discusses the effectiveness of using satellite communication for international medical communications, specifically for communication between medical practitioners. Setting the Stage for Telehealth - Familiarize yourself with the equipment and technology. Although I'm far from being an IT expert, I now have a better understanding of how the system works, including how to troubleshoot common problems. Doing a test run with your office staff before starting with a patient is a good idea for those of us entirely new to telehealth. - Have someone available during the virtual visit who can provide (or obtain) additional tech support if needed. Having alternative options to reach the patient (e.g., phone, email, text) in case something goes down also proved essential. - Assess the patient's familiarity with telehealth and provide orientation as needed before the virtual encounter. Explain why you are using telemedicine (e.g., to keep patients safe, provide better access, improve patient convenience, etc.). - Assure patients that the telehealth visit is secure and will not appear online. - Consider giving patients a telehealth checklist to help them better understand the process, set expectations, and prepare appropriately on their end. Here are a few examples of items you can include on a patient telehealth checklist:

11. Conclusion

Offers the ability to communicate with isolated patient populations across significant geographical distances, helps address regional healthcare infrastructure and provider shortages, and saves all parties, including the patient, time, and money. In emergencies, telemedicine can connect patients with teams of providers and specialists and expedite care. Telemedicine shows promise as a triage method that could reduce wait times and patient volumes in emergency departments.

Telemedicine can be categorized into three purposes: 1. Doctor to doctor: Medical consultation 2. Nurse to doctor: Medical consultation 3. Patient to doctor: DPC (Direct Patient Care) These categories are determined by communication partners. While the first two purposes are sanctioned by legal systems worldwide, DPC is not generally permitted, but there are efforts to legalize it internationally. The text also describes the effectiveness of using satellite communication for medical facilities, especially for international medical communications aimed at connecting medical practitioners. The medical-legal aspects of telemedicine in Italy have revealed that the evolution of telemedicine raises several legal issues, especially regarding confidentiality. Researchers emphasize that telemedicine should not replace traditional health services, but rather be integrated to enhance effectiveness and efficiency.

In a study on the medical and legal aspects of telemedicine in ophthalmology, it was found that telemedicine may improve patients' access to higher-quality healthcare, but ethical and legal concerns serve as barriers to its widespread use. A systematic review of the ethical principles of telehealth revealed that few studies are identifying the ethical implications of telehealth and its impact on the community.

Ethical issues in telemedicine, such as autonomy, the patient-doctor relationship, non-maleficence, and beneficence, are important considerations that need to be addressed before widespread adoption of telemedicine. A comparative study comparing telemedicine ethics guidelines from the AMA (American Medical Association), WMA (The World Medical Association), and the HPCSA (The Health Professions Council of South Africa) found a gap between these guidelines and practitioner perspectives. This gap is attributed to variations in international practice and the complexity of patient-provider interactions. Closing this gap between the guidelines is crucial.

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