

DEFINITION AND HISTORY OF TELEMEDICINE

Abduqodirov Nuriddin Faxriddin o'g'li

Assistant of the Department of "Information Technologies, Biophysics and Medical Physics" of Samarkand State Medical University.

Abstract: Telemedicine is the delivery of healthcare services through information and communication technologies, enabling patients and healthcare professionals to communicate without being in the same location. It has become an essential component of modern healthcare by improving access to medical services, reducing travel time, and supporting timely diagnosis, treatment, and follow-up care. The history of telemedicine began with the use of telephones and radio communication for medical consultations and has evolved significantly with the development of the internet, mobile devices, cloud computing, and artificial intelligence. Today, telemedicine includes video consultations, remote patient monitoring, electronic health records, and mobile health applications. Its rapid expansion, particularly during global health emergencies such as the COVID-19 pandemic, has demonstrated its value in increasing healthcare accessibility, efficiency, and quality. This paper provides an overview of the definition of telemedicine, its historical development, and its growing importance in the digital transformation of healthcare.

Keywords: Telemedicine, Digital Healthcare, Information and Communication Technologies (ICT), Remote Patient Monitoring, Teleconsultation, Mobile Health (mHealth), Electronic Health Records (EHR), Telehealth, Healthcare Digitalization, Artificial Intelligence (AI).

Introduction: The rapid development of information and communication technologies (ICT) has transformed many sectors, including healthcare. One of the most significant innovations in modern medicine is **telemedicine**, which enables healthcare professionals to provide medical services remotely using digital communication tools. Telemedicine has become an effective solution for improving access to healthcare, especially for people living in rural and remote areas where medical specialists and healthcare facilities may be limited. The concept of telemedicine has evolved over several decades. Initially, medical consultations were conducted through telephone and radio communication. With the advancement of the Internet, high-speed networks, smartphones, cloud computing, and artificial intelligence, telemedicine has expanded into a comprehensive healthcare system that includes video consultations, remote patient monitoring, electronic medical records, and mobile health applications.

Main body: Telemedicine is the delivery of healthcare services over a

distance using information and communication technologies. It involves the electronic exchange of medical information to support diagnosis, treatment, and disease prevention. It should not be confused with the broader concept of telehealth, which also encompasses non-clinical services, including public health, research, and administration. Telemedicine typically uses digital platforms, including phone and video calls, messaging services, and online portals, to connect patients and providers across locations.

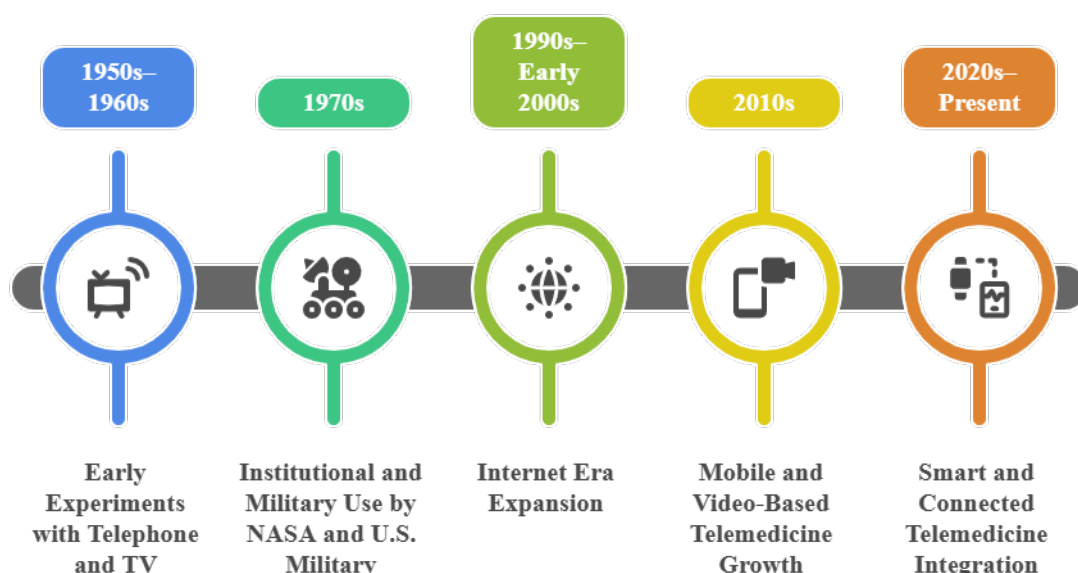


Figure 1. Evolution of Telemedicine: A Historical Journey

The history of telemedicine dates back to the mid-20th century, when early innovators used telephone lines to transmit radiographic images and electrocardiograms. In the 1950s and 1960s, health professionals experimented with closed-circuit television systems to enable medical consultations between urban specialists and rural hospitals. Advances in microwave technology have enabled the transmission of images and patient data over long distances. During the 1970s, the National Aeronautics and Space Administration (NASA) and the U.S. military invested in telemedicine to support astronauts and soldiers stationed far from specialist care. The widespread adoption of the Internet and mobile devices in the late 1990s and early 2000s marked a turning point, making telemedicine more accessible to a broad audience. Today, high-speed networks, smartphones, and wearable sensors underpin a diverse ecosystem of telemedicine services ranging from virtual consultations to remote patient monitoring.

Types of Telemedicine Services: Telemedicine services can be categorized by their mode of interaction, the timing of information exchange, and the nature of the clinical activity. A widely used classification distinguishes between synchronous, asynchronous, and remote monitoring services. Synchronous services, also called

real-time or interactive telemedicine, involve live video or audio communication between the provider and the patient. This category includes virtual office visits, teleconsultations with specialists, and facilitated virtual visits conducted at a remote clinic using peripheral devices such as digital stethoscopes or otoscopes. Asynchronous, or store-and-forward, telemedicine refers to the transmission of patient information – such as medical images, videos, or recordings – to a clinician who reviews it at a later time. Applications include teleradiology, telepathology, and teledermatology. Remote monitoring involves the continuous or periodic collection of health data from a patient's home environment using wearable devices or sensors, which transmit the data to healthcare providers for evaluation, allowing early detection of changes in health status .

Service Type	Description	Typical Examples
Synchronous (real-time)	Live video or audio consultation between patient and provider.	Virtual office visit, remote specialist consult, facilitated examination
Asynchronous (store-and-forward)	Transmission of recorded information to be reviewed later.	Teleradiology, telepathology, teledermatology
Remote Monitoring	Continuous or periodic collection of health data at home.	Blood pressure monitoring, heart rhythm devices, and glucose sensors

Teleconsultation and Telemonitoring: Teleconsultation is the provision of clinical services via real-time communication technologies. It enables healthcare providers to evaluate, diagnose, and treat patients remotely. Typical teleconsultations involve a video or telephone connection between a patient and a clinician or between two providers. For example, a primary care doctor may arrange a synchronous teleconsultation with a cardiologist to discuss a patient's electrocardiogram results. Facilitated teleconsultations may be conducted in community clinics, where nurses or community health workers assist patients and use peripheral devices to capture vital signs and images for interpretation by the remote physician. Teleconsultations improve access to specialists, reduce travel time, and enable timely advice, particularly in remote or underserved areas.

Telemonitoring, or remote patient monitoring, refers to the continuous or periodic collection of physiologic data from patients outside clinical settings.

Wearable sensors, connected scales, blood pressure cuffs, pulse oximeters, and glucometers transmit data to healthcare providers, who can identify early signs of deterioration and adjust treatments. Remote monitoring is widely used to manage chronic diseases such as diabetes, heart failure, and hypertension. Research suggests that remote monitoring devices can enhance patient adherence, improve outcomes, and reduce hospital readmissions. Telemonitoring often complements teleconsultation: data from remote monitoring can trigger a virtual visit or inform follow-up decisions.

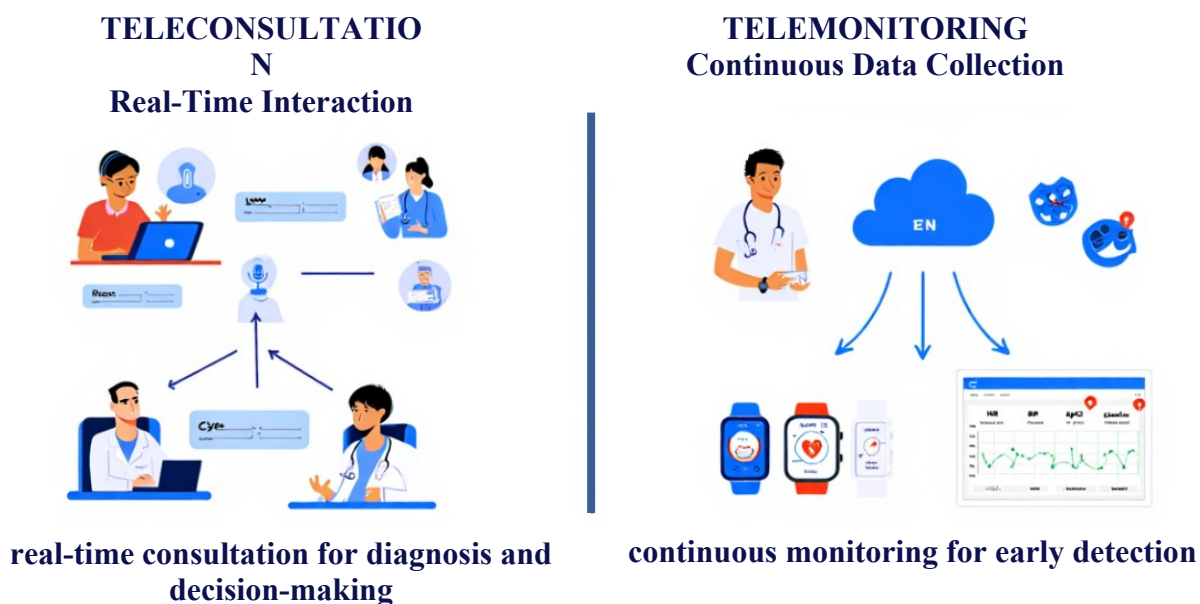


Figure 2. Teleconsultation and Telemonitoring in Clinical Practice

Conclusion: Telemedicine has become an essential part of modern healthcare by enabling the delivery of medical services through digital communication technologies. From its early use of telephone and radio communication to today's advanced systems based on the Internet, cloud computing, mobile applications, and artificial intelligence, telemedicine has continuously evolved to meet the growing needs of patients and healthcare providers. The historical development of telemedicine demonstrates how technological innovations have improved access to healthcare, especially for people in remote and underserved areas. In addition, telemedicine has increased the efficiency of healthcare services, reduced costs, supported continuous patient monitoring, and facilitated collaboration among medical professionals.

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