# **Chapter 5: Telehealth Processes and Implementation**

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## **Abstract**

This chapter explores the processes and implementations of telemedicine, emphasizing its evolution, technological advancements, and integration into healthcare systems. Telehealth and telemedicine are defined as pivotal tools for delivering healthcare remotely, overcoming geographic barriers, and improving accessibility. Telehealth encompasses the holistic picture of clinical services, patient education, and data analytics, while telemedicine focuses specifically on clinical care. The historical progression of telemedicine is highlighted, tracing its roots from early innovations like telecardiograms to contemporary applications leveraging internet connectivity, artificial intelligence (AI), and 5G technology.

Telemedicine operates through various modalities, including real-time (synchronous) interactions, asynchronous (store-and-forward) consultations, remote monitoring, and hybrid models. These approaches enable applications such as teleradiology, wearable device monitoring, and video-based psychiatric care. The integration of telemedicine with electronic medical records (EMRs) and adherence to global standards ensure data continuity and quality care.

The technical and operational aspects of telehealth platforms are detailed, covering performance testing, secure data storage, and equipment commissioning. Modern telehealth platforms enhance patient engagement with user-friendly portals offering access to medical records, prescriptions, and teleconsultation histories. Training healthcare professionals in telemedicine-specific skills is crucial to effectively utilizing these platforms while maintaining ethical standards and safeguarding patient privacy.

Telemedicine demonstrates immense potential to reduce healthcare disparities, particularly in underserved regions, through models like the “hub-and-spoke” system. Also, Telemedicine plays a critical role in managing chronic conditions, mental health support, and public health interventions. Digital tools for managing diseases such as diabetes, hypertension, and HIV have shown measurable improvements in patient outcomes.

While the benefits of telemedicine are substantial, challenges persist. These include technological limitations, interoperability issues, and the risk of misinformation stemming from inadequate physical examinations. Governance frameworks, continuous quality improvement, and collaboration among stakeholders are essential to address these issues and ensure telehealth’s sustainability and effectiveness.

Future advancements, such as virtual hospitals, exemplify telemedicine’s potential to transform healthcare delivery. By utilizing teleconsultations, remote monitoring, and integrated care approaches, virtual hospitals provide comprehensive, patient-centred care without physical infrastructure. The chapter also underscores telemedicine’s role in advancing public health by improving accessibility, enabling early intervention, and aligning with population health goals. Through proactive strategies and equitable implementation, telehealth can optimize healthcare resources, address disparities, and enhance health outcomes globally.

## **Definitions**

Many terms exist to describe remote care, that is when the care seeker and the provider are not in the same place.

**“Telehealth”** *(~distance ~ health)*is the usage of information and communications technologies (ICTs) to deliver health services where there is physical separation between the care provider and care seeker. It tries to *replace the movement* of recipients, health professionals or educators *with* *transmission of health information* in a digital format. (1) Since many components of health provision, like physical checkups, and procedures are not possible online, a telehealth service needs to be used as an adjunct to an existing health service. It includes telemedicine and also ancillary health services like remote patient and medical education, and data analytics to work towards epidemiology and public health planning and strategy.

“**Telemedicine**” (*~distance ~ medicine*) is the older and more commonly used term with a relatively limited scope. It is restricted to clinical services only, meaning direct delivery of remote medical care. By definition it is “the process of exchanging medical information from one site to another via electronic communications to improve a patient’s clinical health status”.

The basic concept in all telemedicine applications is that a client of some kind (e.g., patient or healthcare worker) obtains an opinion/advice from someone with more expertise in the relevant field using telecommunication, while the two parties are separated by distance, by time or by both. (2) The types of information that can be transferred from site to site include clinical documents, laboratory results, digital photographs, electrocardiograms (ECGs), radiographs, magnetic resonance imaging (MRI) scans, computed tomography (CT) scans, real-time ultrasonography, video recordings, auscultatory sound from electronic stethoscopes, and physiological examination parameters such as blood pressure, heart rate, haemoglobin saturation, spirometry, and so on.

The term **“Digital Health”** extends telehealth to even non-remote services which use computation skills and digital means such as high-end image processing, clinical and diagnostic decision support systems (CDSS/DDSS), ePrescriptions, AI.

## **History and Buildup of Telehealth**

Telehealth has evolved significantly over time, beginning in the 19th century with the use of telegraphy and radio for remote medical communication. By the mid-20th century, innovations in technology were applied to healthcare, marking a new era of telehealth. The 1960s to 1970s introduced video conferencing and teleradiology, enabling remote diagnostics and consultations. The internet's advent in the 1990s revolutionized telehealth with real-time video, electronic medical records, and digital image sharing. More recently, AI, wearable devices, and 5G technology have expanded telehealth's scope, making it an essential healthcare tool, especially during the COVID-19 pandemic. The evolution of telehealth over the time periods is described in Figure 1.

A chart of different colored arrows

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Figure 1 Evolution of Telehealth ( “copyright: authors” )

All living organisms communicate – an important component to maintain social wellbeing, Communication between animals, largely in the form of sound, is well known but the same is slated to be true for plants too. Most human communication is through sound but facial expressions and hand gestures[[1]](#footnote-1) are also used. Health is a basic need. Care providers are scarce in remote areas. Efforts for distance communication beyond visual and hearing range, in the form of pigeon carriers, drums and smoke signals, for example, are part of history books as well as related movies. Kings and other powerful gentry had an inhouse physicians to look after their health needs. During wartime, and also travel, summons used to be sent for the physical presence of the health provider alongside the problem statement of symptoms using available communication media.

The earliest documented instance of using communication technology for clinical purposes was published in *The Lancet* in 1897, where a telephone helped diagnose a child with croup.(3) This marked the beginning of many significant milestones in the evolution of telehealth. The term “Tele” was first applied to medicine by Dutch physician Einthoven in 1905 when he reported telephonic transmission of electrocardiographic images, calling it a “Tele-cardiogram.”(4) By 1910, telecommunication networks enabled the transmission of amplified stethoscope sounds via telephone.

In the 1920s Australia’s flying doctors’ service was started. Bicycle powered radios were used to request medical help from far-off settlements. In the 1940s, transmission of radiography through telephone circuits between cities 20 miles apart was initiated in Pennsylvania. Multimodal transmission started in the late 1950s and early 1960s. In 1959, the University of Nebraska used interactive television (IATV) to transmit neurological examinations, widely considered as the first case of a real-time video telemedicine consultation. Telepsychiatry, through remote counselling, followed. The term “Telemedicine” was first coined in the 1960s, with Bird and his colleagues formally introducing it in 1969 to describe the delivery of medical care without direct patient–physician interaction. (5) Later, in 1978, Bannet and his associates introduced the term “Telehealth” to extend the concept of telemedicine, incorporating patient and clinician education. (6)

When the National Aeronautics and Space Administration (NASA) began plans to send astronauts into space, the need for telemedicine became all too clear. For monitoring purposes, telemedicine capabilities were built into the spacecraft as well as the first spacesuits. In the 1960s, NASA, Lockheed Corporation, and U.S. Indian Health Service joined together to work on Space Technology Applied to Rural Papago Advanced Health Care (STARPAHC) project to provide telemedicine access to an American Indian reservation via telecommunication links used for space stations. Different projects were funded across North America and Canada in order to realise the exciting potential of this new innovation.

Other programs followed, focussing on transmission of medical data such as fluoroscopy images, X-rays, heart and chest sounds from a stethoscope, and electrocardiograms (ECGs). The main motivations of these early projects were providing access to health care in rural areas and for medical emergencies. Use of the internet exploded at the turn of the century, leading to the expansion of telemedicine modalities. From the 2000s onwards, telemedicine coordination became a part of health informatics. (7)

The actual impact on telehealth came about much later since the bandwidth required was not sufficient initially. Among the earliest beneficiaries were those using audio or images, in the form of patient conversations, heart sounds, speech therapy (for sound) and radiology, dermatology, cardiology (ECG, echo, angiograms), ophthalmology, pathology and so on for images. A third group was related to use of video conference (psychiatry); tele-mentoring and robotic surgery were part of this.

Special tools and devices to enable controlled data transfer emerged, for example, tele-stethoscope and tele-ECG, tele-ophthalmoscope, large-sized scanners for X-rays – remembering that X-rays are transparencies. Tele-ultrasound machines were available, allowing remote viewing by the radiologist while the probe was moved by a remote person. Similarly, there are specialized remote microscopes allowing the movement of the slide to be remotely controlled with zooming on a real-time basis for telepathology. Digital tools for measurement of vitals (blood pressure, sugar, temperature and later SpO2) were key components of the systems.

There were issues since most provisions were customized solutions for high-end isolated applications, for example, telepathology, tele-radiology and tele-psychiatry. There was rapid obsolescence because connectivity as well as computing speeds were following Moore’s law. (8) Since the frequently required maintenance was not available locally, breakdowns meant stoppage of services. That systems and software could not communicate with each other led to initiatives towards standardization.

## **Telehealth Processes**

To understand remote care, we need to understand how a day-to-day care process operates and the changes or evolution required to emulate the same remotely. A person falling sick will take an appointment from the allocated usual General Practitioner , who will note the history, do some physical examination and then, based on the assessment, prescribe some medicines or tests.

The same scenario works in online care too. However, appointments may be quicker with less time spent on travelling. Information is transmitted after digitization as already described in Chapter 4. Examination may not be completely possible but images and sound transmission, through various devices do allow for partial completion. Only palpation and smell as of now are not directly possible, but an assistant or junior person can relate some components. In the current day and age, almost all types of investigations are transmissible either as the values of haemoglobin (Hb), blood sugar or any other, or as images in the form of X-rays, ECGs, or videos. That the role of investigations for assessment and planning is rising only adds to the possibilities of remote care. Based on the assessment, just like offline, a prescription is made and transmitted back, which may include a call for further tests.

Any transmitted data also goes into memory systems and is available for later reuse for analytics, treatment planning and long-term health strategy such as public health. This is best done through storage in the patient’s electronic health record (EHR).

## **Modes of Telemedicine Service Delivery**

* Real-time or synchronous
* Asynchronous or store-and-forward (S&F)
* Remote patient monitoring
* Hybrid.

In real-time (synchronous) mode,the stakeholders, that is, the engaging parties, which could be patient/ immediate care provider and a remote care provider, are separated physically but in the current time zone. Current time zone means that a person in the Pacific islands, 11 hours before UTC, is communicating by audio call or a video-conference at 8am with a care provider in the UK with the time there being 9pm of the previous day UTC time. There is no time lapse (except for 1–2 seconds for data transfer to take place) between transmission and receipt. Video/audio calls are examples of real-time delivery, which also covers live ultrasound, that is, the probe is held and moved by technician in the peripheral location, and also the viewing of images of the slides by a senior pathologist while the camera is being manipulated by the assistant peripherally. Remote psycho-counselling via video conference is an important example. (9)

**Telementoring** (*telemonitoring, see below, is different*) is when a relatively junior or novice care provider is guided by an expert on doing a procedure. In 2003, a pilgrim at the Sabarimala temple in Kerala, India, got severe chest pain and breathlessness. The doctor posted in the local health centre confirmed a tension pneumothorax following a chest X-ray. He was then guided by a cardio vascular and thoracic surgeon from the main Amrita hospital, Kochi, 250 km away, to place a chest tube, with resultant immediate relief. (10)

Another form of telemedicine is Store and forward (S&F) or asynchronous. In S&F there is a mandatory data storage component, with data being uploaded to a server with common access. This allows a time lag between the data transmission and view. Patient-related information (e.g., history, examination findings, investigation reports and other details) is first digitalized and then transmitted to the server where it is stored It can then be “forwarded” or rather “retrieved” as per the need or requirement of the person (Expert!) who provides the consult. This data may be of text, documents images, movies (e.g., ultrasound, angiograms, videos of the gait of the patient) and sounds. For hospitals, storage can be part of their EHR, loaded preferably on a cloud-based server), allowing common access by the care providers to view history and documents of specific patients. Online access by patients will allow uploading of history and downloading of the prescription. The doctors and specialists view the data, then upload the advice as text or through documents, such as the prescription, and further orders for investigations.

While real-time interactions are easier to do, requiring very little training, they have high bandwidth considerations and a need for a strict appointment schedule. Data analytics is a bigger challenge, which AI may be able to solve. Specific nuances of attending an audio or video calls are important.

S&F interactions are less taxing on bandwidth and time but require a well-tuned application. With the clinician’s time being the most expensive component of teleconsulting, it would be expected that they would prefer S&F rather than real-time interactions, but there are problems. Inputting errors occur due to spelling mistakes, made worse by autocorrect. Under-information, incorrect information and over-information (sometimes with unnecessary detailing) create problems. Standards are important to allow common understanding of the data between disparate entities and care providers. Related issues are to ensure patient privacy and confidentiality besides retaining empathy – an important component of healthcare support. All these require special learning, not only of the doctors but also the staff co-ordinating the interactions.

A close-up of a medical monitor

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Figure 2: Clinical Parameters recorded from multimonitor can be used for remote monitoring ( “copyright:authors”)

The third mode, Telemonitoring, is when data generation is done by machines or devices at the patient end. The transmission and/or viewing may be on a real-time basis or stored for later review. The cardiac Holter was the first such example. Infant monitors which ensure the wellbeing of the baby and also robots assisting the elderly populace in remote locations are commonly used cases. Devices like blood pressure monitors, blood sugar machines and SPO2 readers are now common and were used routinely during COVID 2019. A manual entry is required and can be part of the EHR. Fall monitors for the elderly, based on the gyroscope in mobile phones are an interesting innovation. A sudden change of posture can notify the nearby emergency services for a coma or hip fracture. Robots moving from one patient to another are common in tele-stroke clinics.

**Modern day apps are** hybrid,that is,a mixture of the above components suiting individual needs. Video-conferencing remains important to correlate information and further questions. This face-to-face connect between the provider and patient provides empathy along with assurance of genuineness of the involved parties. Apps are important for data security and confidentiality – ensuring only privileged access and ensuring payments. Payment gateways are important if direct patient service is the goal.

Current telehealth platforms are designed with user-friendly patient portals that enhance patient engagement. These portals provide access to teleconsultation histories, medical records, prescriptions, and follow-up plans. Such features not only empower patients to actively manage their health but also facilitate better communication with healthcare providers, fostering trust and collaboration.

# **Components of Telehealth** – **Devices**

Devices that allow the clinicians to examine the patient remotely are available. Some of the bulkier devices have become somewhat unnecessary because a smart mobile with a camera and speaker can replicate the functionality at low cost.

### Tele-stethoscope

Tele-stethoscopes allow remote hearing of heart sounds; they can be transmitted live or stored in memory for later recording.



Figure 3 (Left) A Tele-stethoscope is a normal Stethoscope with intervening Bluetooth amplifier and transmitter. The sound heard and amplitude of the sound waves displayed on a mobile screen

Figure 4 (Right) Digital blood pressure monitor with a Tele-stethoscope (images donated by Author))

The tele-stethoscope can function as a normal stethoscope but can also transmit the sounds by Bluetooth or a sound cable to a nearby mobile or computer from where it can be transmitted further.

### ECGs

A close-up of a medical device

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Figure 5 ECG for remote monitoring Image courtesy: Pexel.com ( https://www.pexels.com), creator: Marta Branco.

ECGs can be transmitted remotely by Tele-ECG machines that can send the ECG reading along with ECG lead labels generally as an image of all the tracings. Live transmission for a doubtful case is possible. The Holter is a specific device described further in Chapter 17.

### Endoscopy

Almost all types of image transmission can be enabled by using a mobile camera, but for high end specialised functions, it is better to have a specific device, which will be fixed directly to the viewer of the instrument. Examples include a fundoscope that has a special slit lamp with camera for eye examination, video layrngoscope for direct laryngoscopy during anaesthesia, a telemicroscope for pathologists (Figure 6), and a dermoscope for dermatologists. Although image or related source manipulation can be done by local personnel, the high-end ones allow manipulation through remote means using robotic arms or geared wheels.

All devices for endoscopy, for example a GI endoscope, laparoscope, thoracoscope, arthroscope, rhinoscope or cystoscope, do use or at least can use an attached camera which can be enabled for remote transmission. The concept of robotic surgery (Chapter 18) is woven around the same devices. An interesting scope is the one used for capsule endoscopy, in which a small camera with a recording device is fed to the patient; this can store as well as transmit images from inside the intestines.

### X-Rays

X-rays are transparencies. If recorded on a digital X-ray machine, the image can be directly transmitted. For transmitting an existing film, large format special scanners used to be in vogue in the first decade of this century. Unlike regular scanners, there has to be light behind the film. A simple flat screen digital TV or computer monitor with the background set to all white is an excellent backdrop for such photographs (see Chapter 4). Mobile usage as a complete picture archiving and communication system is described in the tele-radiology section of Chapter 17.

### Various types of information communicated in a telemedicine consultations

Clinical information gathered from above devices are transferred between telemedicine parties can be in the format of data/text (ECG), still images (X-ray or dermatology images), audio tracks (audio call centres) or videos (ultrasound scans, telepsychiatry). The information can be transferred synchronously in real-time or recorded and forwarded later, as described in Chapter 4.

A microscope and a computer on a table

AI-generated content may be incorrect.  
***Figure 6: Practice of Telepathology- Microscope enabled with image transmission used for Practice of Telepathology ( Image courtesy: Pexel.com ( https://www.pexels.com), creator: Vladimir Srajber.***

## **Clinical Aspects of Telehealth**

The following subsection explains the concepts of obtaining patient consent, methods of conducting telemedicine consultations, the skills required by healthcare practitioners to practice telemedicine, and how to prescribe medicine online.

Types of telemedicine interactions: Telemedicine consultations can be categorized into several types, each serving a specific role in healthcare delivery. These consultations regarding a patient can take place between two healthcare professionals in two separate healthcare institutes or within the same institute. These can be called as Doctor to Doctor (D to D) and centre to centre (C to C) and these take place between a junior doctor and a more experienced one or between two or more specialists. Also, consultations directly between doctor and a patient which can be called as D to P.

* **Patient to doctor** consultations involve direct interaction between the patient and a healthcare provider, typically via video, phone, or text, enabling the doctor to diagnose and offer treatment plans remotely.
* **From health worker or junior doctor** to expert consultations occur when a healthcare worker or junior practitioner seeks advice from a more experienced or specialized professional, often in real time, to ensure accurate diagnosis and treatment decisions.
* **Between care providers** is less hierarchical. It refers to telemedicine interactions where various healthcare providers, such as specialists or primary care physicians, collaborate remotely to manage a patient’s care, ensuring a comprehensive and coordinated approach. While COVID-19 gave a push to online meetings, and apps like Zoom®, Google Meet® and Teams® by Microsoft® became popular, even now most conferences are held in hybrid mode – which means a physical as well as an online component. See Chapter 4 on how to conduct a video conference.
* **Data Monitoring and Analysis** are integral components of telehealth, offering tools to enhance the quality and safety of healthcare delivery. In telemedicine, continuous data monitoring involves real-time collection, evaluation, and reporting of patient health information, enabling proactive care. (11) With technologies such as wearable devices, remote monitoring tools, and EHRs, healthcare providers can access and assess patient conditions, track treatment progress, and predict potential health. (12) For instance, wearable devices such as smartwatches are increasingly used to monitor vital signs such as heart rate, blood oxygen levels, and physical activity in patients with chronic diseases including diabetes or heart conditions. In 2020, the widespread adoption of remote monitoring in COVID-19 care allowed clinicians to track oxygen saturation levels of isolated patients at home, ensuring timely hospital interventions when necessary. (13) Similarly, platforms like Teladoc Health, Amwell and Coviu utilize advanced data analytics to deliver insights into patient progress and optimize care plans for remote consultations. Effective data analysis helps optimize telehealth implementation by identifying trends, improving clinical outcomes, and ensuring compliance with regulatory standards, including patient consent and data privacy. (14) For example, Medibank Private (Australia) and Kaiser Permanente (United States) integrate telehealth data with predictive analytics to identify patients at risk of complications, enabling early interventions in conditions like hypertension. However, the use of telemedicine also demands robust skills from healthcare professionals to interpret complex datasets, prescribe interventions accurately, and align their practice with ethical considerations, particularly in the remote delivery of care. (15)
* **Remote homecare** is a hybrid system useful for the elderly and infirm who are relatively immobile. There are machines and devices to measure day-to-day variations in blood pressure and blood sugar, and patients are monitored on video camera to check their wellbeing, detect emergencies like falls due to stroke or even a slip causing a hip fracture, and to provide support in the form of medication reminders. These are supplemented by visits from nurses or other care providers to maintain health support for chronic diseases.
* **mHealth** modalities encompass mobile health solutions, including apps and mobile devices, that allow patients and healthcare providers to manage health-related tasks, such as appointment scheduling, monitoring symptoms, and accessing health information, directly through mobile technology. Lastly, remote monitoring involves the use of technology to track a patient's health status remotely, typically for chronic conditions or post-operative care, allowing healthcare providers to monitor vital signs and other health metrics without the need for in-person visits. Each of these types plays a vital role in improving access to healthcare and enhancing the quality care.

#### **Hub and spoke model in Telemedicine**

Low-middle-income nations have long used a model called “hub and spoke” for telemedicine services, which is comparable to the C2C or D2D concept. Primary, secondary and tertiary care facilities can use this paradigm; the tertiary care facility serves as the hub, and the primary and secondary care facilities serve as the spokes. Tertiary care facilities provide more sophisticated care, and primary and secondary care facilities offer more basic treatment. In order to give secondary and primary care centres access to tertiary care centres’ services, primarily for teleconsultations, these centres were connected by telemedicine facilities. This leads to patients saving a lot of money and time. (16)

### Telehealth Mobile Applications

A camera lens on a phone

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Figure 7 Smart mobile phone enabled with an extended camera with an attached Lens for closeup photos (Image courtesy: Pexel.com ( https://www.pexels.com), creator: Erik Mclean. -



Figure 8 Mobile phone screen showing multiple applications ( Image courtesy: Pexel.com (https://www.pexels.com), creator: Shivanshu Sharma.

Telehealth has been a major beneficiary of the rise of mobile computing. Not only is it easy to use, but all the required components for transferring text, images, sound, and so on are available in telehealth apps that bring them all together. Apps also have provisions for registering a patient to allot them a unique ID, take consent, allow payments through specific payment gateways and make appointments for the all-important final video call, allowing allows eye contact and empathy, with no extra equipment now required. Specific apps can also integrate the above with special sensors such as GPS, and special software for specific needs such as for recording heart sounds (tele-stethoscope); they have in-built image viewers for radiology images and a zoom for viewing details within the eye.

### Informing the consumer/patient about telehealth/telemedicine

It is crucial to ensure that patients or consumers are fully informed about telemedicine and other healthcare delivery options available to them. Key information to be communicated includes the roles and responsibilities of all individuals involved in providing telehealth services. Patients should be made aware that while industry standards are followed to help ensure the security and privacy of their data, complete protection cannot be guaranteed. If non-standard solutions are employed, patients must be informed of any potential risks to the quality, reliability, or security of their care. Additionally, patients need to be informed about any upfront costs associated with telemedicine consultations and how these compare to alternative healthcare options. Finally, patients should be provided with clear instructions on how to file complaints regarding telemedicine services.

### Using telemedicine in delivering care

The role of telemedicine in the overall management of a patient’s care, as well as the continuity of that care, must be clearly communicated to the consumer. Any limitations to using telemedicine should be identified and minimized wherever possible, with patients being informed accordingly. The referring healthcare provider is responsible for verifying the patient's identity to the remote specialist, as well as confirming the identity and credentials of the distant specialist to the patient. At the beginning of each telemedicine session, patients should be informed about the estimated time required for the consultation. In some cases, a healthcare provider from the referring organization should be present with the patient during part or all of the video consultation.

Whenever possible, evidence-based guidelines should be followed in telemedicine practice. When these guidelines are not applicable, a suitable framework tailored to the clinical purpose should be applied. To safeguard patient privacy, protocols addressing privacy concerns must be established and adhered to. Additionally, protocols governing the cooperation between various healthcare providers involved in telemedicine must be in place, including determining the most appropriate referral routing and ensuring that care fragmentation is minimized. The referring practitioner should also consider the availability of in-person appointments if necessary.

A list of suitable health professionals for telemedicine referrals should be published, and an explanation of the care provided, including modifications to regular professional responsibilities, must be clearly outlined. This includes documenting the modalities of care, such as ordering tests, generating prescriptions, and follow-up procedures. It is essential that each healthcare professional involved in a telemedicine consultation maintains separate medical records when interacting with the patient simultaneously.

While issuing medical certificates through telehealth consultations is not encouraged, it should be regulated under Standards of Practice. Cross-border telehealth practices should be limited to health education and advice. In the case of a referral, access to patient records may be granted to another practitioner only with the explicit consent of the patient.

Adequate training is essential for telehealth providers, with clear criteria established for the skills required of healthcare practitioners using telehealth. This training should be organized by each telehealth platform institution, under the guidance of health officials. A foundational step in this process can include an orientation on basic guidelines, ensuring that healthcare providers are well prepared to effectively deliver telehealth services.

### The Role of General-Purpose Apps such as WhatsApp

Unlike specific telehealth apps that require a specific license (which has costs in the form of either licensing or providing a certain referral cost data ownership etc.) many doctor prefer to use available day-to-day tools such as WhatsApp, although there are many advantages and challenges.

Indeveloping countries, it has become a platform for reaching patients in remote areas who have limited access to dedicated telehealth platforms. It is user-friendly and requires minimal technical skills, making it suitable for patients with low digital literacy. WhatsApp is free to use, reducing the cost barrier for both patients and providers, especially in resource-constrained settings. WhatsApp supports video calls, image sharing, and document transfer, making it versatile for various consultation needs.

There are challenges regarding privacy and security: while it offers end-to-end encryption, concerns remain about the security of medical information shared on a platform not specifically designed for healthcare. Medical consultations through open apps like WhatsApp do raise concerns about professionalism and adherence to ethical guidelines, since the data can be forwarded without control. Integrating data from WhatsApp consultations into electronic health records can be challenging, potentially leading to fragmentation of care.

WhatsApp lacks specific features found in dedicated telehealth platforms, such as patient portals, appointment scheduling, and billing systems.

### First and Second Opinions

This section provides a guide to utilizing telemedicine for first and second medical opinions in resource-constrained settings, with a focus on underserved communities worldwide. These need to be defined first.

**A First Opinion** by definition is the first time a patient seeks professional medical advice for a new health concern. It involves a comprehensive assessment of the patient's symptoms, medical history, and relevant information in order to to arrive at an initial diagnosis. Normally a treatment plan is made that has recommendations for treatment, generally through medication, lifestyle changes, therapy, or referral to other specialists. The treatment plan is medium-agnostic, meaning it can be delivered in-person or via any form of telemedicine, including video, phone, or asynchronous communication.

**A Second Opinion** on the other hand is a consultation with a different healthcare provider who was not involved in the first opinion consultation. It is sought to confirm the initial diagnosis, explore alternative treatment options, or gain a fresh perspective on the condition. This is generally initiated by the patient to address concerns, seek reassurance, or explore different approaches to their care. Patients may seek a second opinion if they have doubts about the diagnosis, a desire for less invasive treatments, or a need for more personalized care. It represents window shopping in healthcare facilitated by the availability of internet-based remote consultations. It helps medical consultants to market themselves.

## **Implementation**

Patients are the main drivers of telehealth services. They normally ask for consults after a search about their condition and the best doctor to serve their needs. They select platforms based on accessibility, ease of use and affordability.

Since a clinician’s time is limited, more so in a remote setting, it is preferable to do some initial preparation before a consultation in the form of understanding what to ask. This is done by having a summary of your health concerns along with current medical records, test results and medication used. A written questions list for the provider helps, as does a stable internet connection, a quiet and private space, and a functioning camera and microphone.

It is important to speak clearly, describe symptoms accurately, and provide relevant details about your medical history. Pay attention to the provider's explanations and ask for clarification as needed. Do maintain a professional and respectful demeanour throughout the consultation, without interrupting the provider.

Adhere to the provider's recommendations of medications and necessary follow-up appointments. Provide feedback to the platform or provider about your experience, including suggestions for improvement, helps*.*

It is important for providers to be trained well and be competent not only in their own specialty but also in using the platform, conducting virtual examinations and utilizing special devices and tools for digital health. Clear and concise communication in a virtual setting, including explaining complex information and building rapport with patients remotely, is described in Chapter 3

Technology barriers frequently need to be overcome, not only by the provider but more so for the patient, Most telehealth app providers do provide a trained technician who assist*s* both the provider and the patient in troubleshooting problems and also provides alternatives to unsolvable issues. Since outsiders maybe involved, the need for professionalism and ethics increases. A special consent form about the risks – including of privacy and confidentiality, and thepresence of non-medical persons onscreen *–* is mandatory. Integration of telemedicine with existing healthcare systems and electronic health records allows data sharing with other providers and has immense benefits in the form of care coordination and continuity of care*.*

Patients seek a second opinion when faced with:

* **complex or high-risk conditions,** such as cancer, heart disease, or neurological disorders,

or when there is

* **diagnostic or treatment uncertainty** in the form of persistent symptoms or conflicting opinions
* **undergoing invasive surgeries** or treatments with potential for serious complications
* **looking for alternatives** to a major surgery, or high cost treatment
* **rare or atypical presentations**, for example, conditions whose specialists are few or far between, such as rare syndromic diseases, congenital problems, and less understood infections, and
* **chronic diseases** requiring long term care, when patients are known to look for alternatives.

## **Where to Access Telemedicine Services**

### Telemedicine services are accessible through various online platforms and mobile health applications, catering to diverse healthcare needs. Global telemedicine platforms connect patients with healthcare providers worldwide, ensuring access to medical expertise regardless of location. In contrast, regional platforms focus on specific countries or areas, offering services in local languages and addressing region-specific healthcare concerns. Additionally, specialty platforms are tailored to specific medical fields such as teledermatology, telepsychiatry, and telecardiology, providing specialized care remotely.

### Mobile health applications further enhance telemedicine accessibility by offering novel methodologies such as AI-powered symptom checkers that provide preliminary health assessments based on reported symptoms. Virtual consultation apps enable patients to engage in video or phone consultations with healthcare professionals, facilitating real-time medical advice. Moreover, remote monitoring applications track vital signs, medication adherence, and other health data, making them essential for managing chronic conditions effectively. Together, these telemedicine services improve healthcare accessibility, efficiency, and patient outcomes.

## **Features of Telehealth Provider Institutes/Platforms**

This subsection details the technical aspects of telehealth coordinated by the telemedicine platform provider, including performance checks of telehealth equipment, commissioning of equipment, and integrating the EMR with the telemedicine platform to ensure sufficient patient data is available for teleconsultations

Registration of the platform: In parallel to clinical practice all institutes providing telemedicine services to individuals who fall within the jurisdiction of the country should list their telemedicine solution platform with the proper authorities in the country. It can be the departmental software registry as well as a health institute regulatory body.

Also, the telemedicine provider needs to use the patient unique identifier system used in the specific country, which assists the exchange of patient information between telemedicine services and hospital EMRs. Adequate methodology should be in place to validate the identity of the patient who is facing the telemedicine consultation. In India, the National Digital Health mission started a process of creating such Health IDs and called ABHA (Ayushman Bharat Health Account). A registration process for proper identification of the care providers (Health Provider Registration – HPR ID) is in place. They have to be adequately qualified and licensed to practice; a Health Facility (HFR ID) which could be hospital or clinic is required alongside to identify where the care provider works. If a guardian who is registered on behalf of the patient is facing the consultation, his/her identity and relationship should be provided to the clinician.

### Minimum data set for telemedicine practice

The International Patient Summary (IPS) is a standardized set of basic clinical data that includes essential health and care-related facts about a patient. It is developed by the Joint Initiative Council which is a collaboration between several organizations and standards bodies. The IPS is designed to be minimal, cross border usable, specialty-agnostic, and condition-independent, making it readily usable by all clinicians for unscheduled patient care (17) This aspect of cross-border usability is of paramount importance for telemedicine consultations, as it emphasizes its potential to transcend geographical limitations and become a universally applicable tool for healthcare delivery.

However, there are some essential data elements important for a telemedicine consultation. The minimum data set should include data elements related to patient identification, details of current healthcare encounters, allergies and adverse reactions, past medical history, past surgical history, regular medication, immunization, laboratory test results and imaging examination result

### Adequate performance of telehealth provision equipment:

To ensure effective telehealth delivery, it is crucial to evaluate the suitability of the information and communications technology employed for clinical purposes. This includes several key considerations. Firstly, the equipment must function reliably over the locally available network and bandwidth. Compatibility between devices on both ends of the teleconsultation is essential to facilitate seamless interactions. Additionally, all healthcare organizations involved must adhere to national standards for securely storing and transmitting health information, aligning with relevant legislation and guidelines. Implementing dual authentication can address specific security concerns in telemedicine. Finally, peripheral devices must be used in a manner that accommodates the needs of both patients and clinicians, ensuring practicality and ease of use.

**The commissioning of telemedicine equipment** involves meticulous installation and testing to ensure optimal functionality. Equipment must be installed according to the manufacturer’s guidelines, ideally in collaboration with the healthcare providers who will use the system. Healthcare providers bear responsibility for ensuring the standards of the devices used during telemedicine consultations. Participating healthcare organizations should conduct joint testing of the equipment and connectivity to verify performance, as specified by the manufacturer.

A thorough risk analysis must be carried out to evaluate potential issues, including their likelihood and severity. Standard of Practice should be established to detect, diagnose, and resolve equipment problems. Once operational, technical support services should be readily available, and an appropriate backup plan must be in place to manage equipment or connectivity failures. For telemedicine services handling urgent tasks, incorporating a backup power source or an uninterruptible power supply is advisable. Furthermore, the technology platform must include a robust mechanism to address customer queries and grievances effectively. Lack of adequate and reliable constant connectivity is the key problem hampering smooth operations.

Artificial intelligence (AI) and machine learning (ML)–based technology platforms should be used only to assist the physician to provide definitive diagnoses or in directly prescribing medications to patients (18)

**Human resource management:** It is imperative to ensure that consumers consult only with registered medical practitioners or healthcare providers who are duly accredited by national medical councils. Technology platforms must conduct thorough due diligence before listing any healthcare professional on their online portals. There is also a need to conduct training programs for professional development for telehealth staff. The platform must ensure that healthcare professionals delivering telehealth services have adequate professional indemnity and insurance coverage. In cases of non-compliance by a health professional, the platform is obligated to report the issue to the relevant professional council.

### Management of the functional features of the telemedicine platform:

To ensure the effective implementation of telemedicine, healthcare organizations must adopt a strategic and well-structured approach. Key actions include:

* formulating a comprehensive strategy to maintain the sustainability of telehealth services;
* analysing workflows and implementing necessary staff adjustments to support telehealth integration;
* approving operational changes required for efficient management of telemedicine applications;
* establishing and sustaining training initiatives or professional development programs for staff using the platform;
* fostering continuous quality improvement to enhance the telehealth program's effectiveness and reliability; and
* ensuring the telemedicine platform is integrated with the EMR system to streamline patient data management, and incorporating a standardized minimum data set for teleconsultations to maintain consistency and accuracy in clinical documentation.

### Important features of the telehealth-specific software platforms

#### **Consumer or patient-friendly features**

Modern telehealth platforms are designed with user-friendly patient portals that enhance patient engagement. These portals provide access to teleconsultation histories, medical records, prescriptions, and follow-up plans. Such features not only empower patients to actively manage their health but also facilitate better communication with healthcare providers, fostering trust and collaboration.

#### **Security and compliance**

Security and compliance are fundamental to telehealth platforms. Features such as end-to-end encryption, multi-factor authentication, and adherence to standards such as the Health Insurance Portability and Accountability Act or General Data Protection Regulation ensure that patient data remains confidential and secure.

#### **Scalability and adaptability**

Scalability and adaptability are additional advantages. Telehealth platforms can be tailored to the specific needs of diverse healthcare settings, from individual practices to large healthcare systems, making them versatile tools for modern healthcare delivery.

By addressing these critical areas, telehealth-specific software platforms enable comprehensive, secure, and effective remote healthcare delivery.

#### **Management of Logistics**: Healthcare organizations must allocate appropriate providers, resources, and physical space for telehealth services to ensure seamless delivery. The use of reliable and suitable equipment is essential to maintain continuity of care. Additionally, telehealth platforms must be technologically equipped to support disease notification systems effectively.

### Digital Health Interventions for Specific Chronic Conditions

Evidence-based digital health interventions tailored to specific chronic conditions are crucial for achieving positive health outcomes.

* **Diabetes:** Wireless monitoring as well as SMS reminders regarding glycaemic control improves outcomes for patients with diabetes. (19) This simple and cost-effective intervention has the potential to improve the lives of millions of people living with diabetes in resource-constrained settings. Digital diabetes education programs, such as those offered through mobile apps or online platforms, can empower patients to take control of their condition and make informed decisions about their self-management. These programs can provide personalized information about diabetes, healthy eating habits, exercise recommendations, and medication management, improving patient knowledge and self-care behaviours.
* **Hypertension:** In Kenya, a pilot program using remote blood pressure monitoring and telehealth consultations resulted in improved blood pressure control and reduced rates of hospitalizations among patients with hypertension. This program utilized a combination of connected blood pressure monitors and mobile phone technology to enable patients to monitor their blood pressure at home and share their readings with healthcare providers. Virtual consultations allowed healthcare providers to provide timely medication adjustments and personalized support for lifestyle modifications, leading to better blood pressure control and reduced risk of complications.
* **HIV:** In South Africa, digital adherence tools, such as mobile apps and SMS reminders, have been shown to improve adherence to antiretroviral therapy, leading to better viral suppression and reduced transmission rates. These tools provide timely reminders to take medication, track adherence patterns, and offer support and encouragement to patients. Online platforms and mobile apps can connect people living with HIV, providing emotional support, sharing experiences, and promoting adherence to treatment. These virtual communities can help reduce stigma, provide a sense of belonging, and offer peer support for managing the challenges of living with HIV.
* **Mental health:** Globally, mobile apps for depression and anxiety are increasingly being used to provide accessible mental health support, particularly in areas with limited access to mental health professionals. These apps offer a range of features, including self-guided therapy modules, mood tracking tools, and relaxation exercises. Digital platforms can also be used to teach relaxation techniques, mindfulness practices, and coping strategies, improving mental wellbeing and reducing stress-related complications. These online resources can provide accessible and affordable mental health support to individuals in underserved communities.

## **Prescribing Medicine in online consultations**

Prescribing medication during telemedicine consultations is permitted only by healthcare professionals who are authorized to prescribe under the country's medical legislation. The decision to prescribe medications after a tele-consult is at the discretion of the authorized medical professional, with professional accountability being the same as in traditional in-person consultations. The regulatory principles that apply to diagnosis and prescribing in physical consultations are equally applicable to telemedicine consultations.

Authorized medical professionals may prescribe medications via telemedicine only if they are satisfied that they have gathered adequate and relevant information regarding the patient’s medical condition and that the prescribed medications are in the patient's best interest. Prescribing without an appropriate diagnosis or provisional diagnosis is considered unethical. The prescribed medication should be provided to the patient in an eligible format, such as a system-generated photo, scan, digital copy of a signed prescription, or an online prescription, sent via email or a messaging platform. Internet-based or system-generated prescriptions are encouraged. If the prescription is being sent directly to a pharmacy, the healthcare provider must ensure the patient’s explicit consent, allowing the patient to have the medicine dispensed at a pharmacy of their choice. The prescription should include the necessary data fields, as specified by relevant regulations.

A diagram of a company

AI-generated content may be incorrect.

Figure 9: Telemedicine and internet-based prescription within the digital health ecosystem ( image recreated by Dr. Prasad Ranatunga from reference – no (2) first authored by Kulatunga et al . ( “copyright: authors” )

Figure 09 shows the position of an internet-based prescription in a digital health ecosystem. Many communities are included in the ecosystem with common goals to improve health services and govern by laws and regulations. The telehealth community is one of its communities –formed from two groups: clinical practice and non-clinical practice. The clinical practice section is large and includes internet-based prescription as well as regulatory bodies, providers, telemedicine service platforms and consumers.

### Proposed Structure of the e-prescription following a teleconsultation

The structure of an e-prescription for a teleconsultation must include mandatory details such as the patient's name, age, date of consultation, and the generic name of the prescribed medications. It should also contain the healthcare provider's name, registration number, qualifications, signature, a rubber stamp image, the practitioner's address, and the current active contact details for patient communication. Optional information may include the presenting complaint, patient history, symptoms, signs, investigations, past medical and surgical history, allergic history, and the trade name of the medication. Having an EMR component within the telemedicine platform allows better extraction of optional information.

### What is an internet-based prescription? (2)

This can be explained as a patient receiving a soft-copy version of a prescription through the internet instead of a handwritten or a printed prescription.

Throughout the world, prescriptions are being sent online frequently. There is a distinction to be made between internet dispensing and internet prescribing. **“Internet drug dispensing / e-prescribing**” means delivery of a valid web-based prescription electronically via the internet to the pharmacy from the point of care after a normal face-to-face consultation with a doctor guiding the patient to collect drugs directly without a paper-based prescription. **“Internet-based drug prescribing or remote prescribing”**, on the other hand, is the act of online prescription that would entitle the patient to receive the drugs from the pharmacy, following a distant teleconsultation without person–person, face-to-face contact between the health provider and patient. Figure 10 demonstrates the relationship of telemedicine and internet-based prescription within the healthcare system.

A telemedicine platform issuing internet-based prescriptions can be based upon a single institute’s stand-alone EMR or an interoperable EHR system. The latter involves the use of past medical records available across many institutes for prescription generation, and the stand-alone system uses health records available only for that specific institute. Figure 11 demonstrates how internet-based prescription is placed within the telehealth/telemedicine components of a digital health ecosystem.

A diagram of a health care service

AI-generated content may be incorrect.

Figure 10: Position of internet-based prescriptions in telemedicine image from the journal article first authored by Kulatunga et.al (2) ( “copyright: authors” )

## **Future in the form of virtual hospitals:**

Virtual hospitals are an innovative application of telemedicine, offering remote healthcare services through advanced digital platforms. These hospitals eliminate the need for physical infrastructure by leveraging teleconsultations, remote monitoring, and mHealth technologies to deliver patient-centred care. Virtual hospitals can manage a wide range of medical conditions, from routine checkups to chronic disease management, by integrating multidisciplinary teams of healthcare professionals who collaborate through secure telecommunication systems. A key benefit of virtual hospitals is their ability to provide continuous care and real-time monitoring, significantly benefiting patients in rural and underserved areas while reducing healthcare costs and minimizing hospital admissions. The Merci Group was the first hospital in the world with no physical doctors. (20) Its use, however, increased exponentially during COVID-19. (21,22)

The seamless integration of EHRs and digital diagnostic tools ensures continuity of care and data-driven decision-making in virtual hospital settings.

Virtual hospitals also play a crucial role during emergencies or pandemics, enabling the delivery of essential healthcare services without exposing patients or healthcare workers to unnecessary risks. (23) As telemedicine continues to evolve, virtual hospitals are poised to become a cornerstone of accessible, efficient, and patient-centred healthcare delivery systems.

## **Public Health Strategy on Telehealth Implementations**

Telehealth significantly contributes to public health advancements by expanding access to care, improving health outcomes, and addressing disparities in underserved populations. Integrating telehealth into public health frameworks allows for the effective management of chronic diseases, mental health conditions, and infectious disease outbreaks. Telehealth platforms can remotely monitor chronic conditions like diabetes and hypertension, enabling early intervention and preventing complications. (24)

Additionally, during emergencies like the COVID-19 pandemic, telehealth emerged as a critical tool for sustaining healthcare delivery while maintaining physical distancing measures. (25)

Public health strategies incorporating telehealth prioritize promoting population health, preventing diseases, and enabling early detection. Applications such as mHealth, and wearable devices, empower individuals to manage their health. By aligning telehealth initiatives with public health objectives, healthcare systems can improve efficiency, optimize resource allocation, and extend services to underserved rural and remote areas.

The successful implementation of telehealth in public health requires a strong policy framework, adequate funding, workforce training, and equitable access to digital health tools. These elements are essential for creating sustainable telehealth programs that support population health management. (26)

## **Specific Topics**

### Appointments and Scheduling

A doctor can only tend to one patient at a time. Even if the clinic timings allow walk-in patients, a receptionist allocates a small token or slip for queue management. Those with longer consultation times prefer that an appointment system be set up either by phone, messaging service or prewritten during a prior visit. There are enough methods to manage emergencies besides that of very important persons.

Real-time consults have to necessarily follow a similar system though any online system allows better scheduling. S&F consults, being asynchronous, do not necessarily have to follow this scheduling process, but few consults are pure S&F; a hybrid consult – meaning history and other details are uploaded along with documents upfront – followed by a video call for correlation are generally done using an app that has a scheduling system as an app component. It is recommended that all telehealth care providers should work through such apps.

Alongside real-time consultations, time slots needs to be set aside for the online visits. Patients who have walked in or taken an appointment for a physical visit should be offered priority. It is unfair to keep the physically present patients waiting because, they are generally paying more and also more likely to complete the full treatment .

Many consultants known by the author prefer to do online consults outside regular clinic hours. Doctors offering online support services for remote patients on a charitable basis provide slots during the afternoon or even late at night. One of them even told me, *I will manage the call from my car when travelling back home* (he had a driver and this wasted time could be better utilized). Working online at the clinic itself, however, offers a better viewing experience – they will be using a desktop with proper lighting and a proper backdrop, besides being dressed appropriately. Having access to the EMR is also an advantage.

Working without an appointment system is not recommended. By working through an app, control of access is also better. The phone number and other contact details of the doctor are kept hidden so that no one calls at odd hours. Managing emergencies through remote methods is not recommended. The clinic’s own pre-registered and patients following an operation from the same institute are exceptions to this rule.

### Personal Health Records and Programming Interfaces

Application programming interfaces (APIs) are transforming healthcare delivery by enabling personalized, seamless and efficient care. Personal health records (PHRs) empower patients by providing them with access to their medical data, including lab results, medication history, and treatment plans, enabling informed decision-making and active health management. (27, 28) APIs facilitate the secure exchange of data between telehealth platforms, PHR systems and EHRs, ensuring interoperability, real-time updates, and data privacy and security.

In telehealth, APIs enable functionalities such as appointment scheduling, medication reminders, and remote monitoring data integration, streamlining the care process and enhancing provider–patient communication.

The adoption of fast healthcare interoperability resources standards further standardizes API development, ensuring consistent and secure data exchange across diverse healthcare systems. (29, 30)

To maximize the benefits of PHRs and APIs in telehealth, robust governance frameworks, user-centric design, and adherence to international data security standards are essential. These measures not only improve patient engagement and care coordination but also contribute to the broader goal of achieving an interoperable and patient-centred healthcare ecosystem. (31)

## **Adverse Consequences**

Adverse reactions in telehealth refer to the unintended negative outcomes or challenges arising from the use of remote healthcare technologies. They underscore the complexities of integrating telehealth into modern healthcare systems while ensuring quality and equity.Table 2 below classified them across clinical, administrative, technical, and general domains, providing insights into their causes, implications, and possible solutions.

Clinically, inadequate information due to limited physical examination and technology-related issues like autocorrect errors or smudgy images can result in incorrect care. Administratively, challenges arise from cross-border licensing restrictions and reliance on unqualified or poorly trained practitioners. Telehealth's technical dependence poses risks such as insufficient emergency support and connectivity failures. Biases favouring well-connected demographics hinder equitable access, and over-transparency in health records can lead to increased litigation fears.

General issues include distractions from irrelevant advertisements and obtrusive IT systems, which may complicate workflows. Dependence on IT systems means that disruptions from power or connectivity failures can halt care delivery. Additionally, the lack of clear reimbursement protocols, especially for unconventional telehealth methods, complicates financial sustainability.

Proposed solutions emphasize awareness of technology limits, adaptive learning, governance mechanisms, and participatory design to enhance user acceptability. Establishing clear guidelines, improving connectivity, and integrating telehealth services into broader healthcare systems are crucial. Addressing these adverse consequences ensures telehealth’s effectiveness and sustainability in modern healthcare.

Table 2 Adverse Consequences of the Practice of Telehealth Adapted from Gogia et al. (32)

| Type | Problem | Explanation | Possible solution | Serious? |
| --- | --- | --- | --- | --- |
| Clinical | Care provision with misinformation or insufficient information leading to incorrect care | Physical examination not possible, smudgy picture, incorrect input, mistyping and misinterpretation and autocorrect/AI mistakes. GIGO principle | Staying aware of technology limits. Use adaptive learning methods and AI to assist data collection | Yes |
| Administrative | Cross-border care (multi-jurisdictional?) | Drug prescriptions not honoured due to licensing rules across borders of various countries and even states in the USA. | Governance and co-operation. Telehealth physicians can take a license for multiple states | No |
| Administrative | Care provision by less or untrained persons | It is always difficult to ensure the full qualification or license of the physician online. Sometimes family members answer calls. | Ensuring guidelines (“Map of Med” for telehealth). Many countries | Yes |
| Technical | Lack of emergency support and retrieval care | Inadequate connectivity or broken links to the requisite support team. | High bandwidth connectivity;  Systems interoperability, backup systems | Yes |
| Administrative | Diversion of funding from more deserving immediate problems (and lack of funding through conventional mechanisms) | Telehealth systems have been promoted as a technology answer to each and every problem (a major reason for failures) | Health economics and cost–benefit analyses;  Public–private funding models | No |
| Administrative/ Technical | Bias towards “best-connected” demographic (including developing world) | Telehealth was supposed to decrease the rich–poor gap allowing developing countries to leapfrog. It has not happened. | Scalable solutions; platform independence of services; better penetration of connectivity | Maybe |
| General | Distraction, diversion and over-information | Irrelevant information and ads which misdirect | Even though antivirus software and firewalls can stop obtrusive input, they themselves may also misdirect | Yes |
| General | Over-transparency | While transparency is good for patient care, too much of it can lead to litigation | Fear | No |
| Technical | User acceptability of new telehealth technology (games, avatars, immersion). Intrusive asking for too many passwords. | The best of systems fail because of human factors. An unused technology or system is literally useless. | Participatory design; interventions targeting youth; training; proper reimbursements | No |
| Clinical | Services established outside ordinary protocols, weak links to EHRs | Use of non-standardized data exchange like WhatsApp or email. Ignoring change management principles | Include the service into the traditional healthcare system and EHRs (if available) | No |
| Personnel | Loss of interpersonal relationships due to wrong words and misinterpretation. | Miscommunication and misinformation is common e.g. auto-typing leading to wrong words. | Rechecks, a general slowdown;  Guidelines | Yes |
| Personnel | Loss of respect for timelines | Calls for help on a 24/7 basis – sometimes the care seeker is in a different time zone | Strict appointment system; guidelines/ work through specific applications |  |
| General | No clear method of reimbursement. Care access through unconventional means competing with regular channels | Insurance companies do not reimburse the travel and time cost. In India, telehealth has had higher success rate since healthcare expenses are out of pocket. | Creation of telehealth-related care and reimbursement protocols; engagement of insurance companies | Yes |
| General | IT systems are obtrusive | Pop-ups ask questions, as well as passwords, repetitively leading to stoppage of work. They act as a master rather than a slave to the clinician. | Making appropriate systems |  |
| General | Dependence on IT systems | When one is used to getting data, non-availability of the internet or even a dead battery in a mobile or laptop can stop clinical work. | Backups and alternative sources | Yes |

## **Conclusion**

Telemedicine has transformed healthcare delivery, providing innovative solutions to overcome geographical barriers and enhance access to care. Chapter 5 explored the key processes and implementations of telemedicine, emphasizing its evolution, technological advancements, and integration into healthcare systems. The chapter highlighted the various modalities of telemedicine – real-time interactions, asynchronous consultations, and hybrid models – that enable diverse applications such as teleradiology, remote patient monitoring, and video-based psychiatric care.

The integration of telemedicine with EMRs and adherence to global standards such as the IPS were identified as critical for ensuring data continuity and improving care quality. Additionally, the chapter discussed the technical and operational aspects of telehealth platforms, focusing on performance testing, equipment commissioning, and the importance of user-friendly patient portals. Training healthcare professionals in telehealth-specific skills was also underscored as a key requirement to maintain ethical standards and protect patient privacy.

Telemedicine has proven to be a powerful tool in addressing healthcare disparities, particularly in underserved regions. Its potential for managing chronic conditions, supporting mental health, and enabling public health interventions was examined, with examples of digital tools improving outcomes for conditions such as diabetes, hypertension and HIV. However, the chapter also identified challenges such as technological limitations, interoperability issues, and risks associated with misinformation or inadequate physical examinations.

### Key takeaways from this chapter include:

* Telemedicine offers immense potential for expanding healthcare access, particularly in underserved areas.
* Addressing technological, administrative, and clinical challenges is crucial for sustainable integration into healthcare systems.
* Robust governance frameworks, ethical practices, and proper reimbursement protocols are essential for the success of telemedicine.
* Continuous innovation, including advancements like virtual hospitals, will further enhance the scope of telemedicine.

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