*ejpmr, 2020,7(8), 39-45*

SJIF Impact Factor 6.222

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Review Article

ISSN 2394-3211

EJPMR

# TELEMEDICINE AND TELEHEALTH: A VIRTUAL CARE PLATFORM WITH PROSPECTS & IMPORTANCE DURING COVID-19 OUTBREAK

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**Article Received on 28/05/2020** **Article Revised on 17/06/2020** **Article Accepted on 06/07/2020**

## ABSTRACT

Telemedicine has pronounced potential to overcome terrestrial barriers to providing access to equal health care services, primarily for people living in remote and rural areas in developing countries like Bangladesh. Telehealth is an assembly of resources or methods for augmenting health care, public health and health education delivery and support using telecommunications Coronavirus and COVID-19 are presently two distressing names to people around the world. An epidemic of fear and hatred has been surging among people over the fast transmission of deadly coronavirus and taking treatment going to a doctor or hospital has become riskier for all kinds of patients, including the COVID-19 ones, telemedicine is imperative now more than ever. The infrastructure for telemedicine and telehealth services are being advanced in the country amid the outbreak of novel coronavirus pandemic as different government and non-government institutions and voluntary groups have come up with healthcare services through virtual center. Telemedicine could possibly save times for patients and cost of health system's operations; it can improve interdepartmental and inter-hospital communication and collaboration; it can provide opportunity for sharing best practices among physicians within Bangladesh and international hospitals, and can enhance better resource allocation. Stakeholders and patients alike are now scrambling to find a telemedicine service, a virtual platform which is facing an unparalleled demand in health sector.

**KEYWORDS:** Telemedicine, Telehealth, COVID-19 Epidemic.

## INTRODUCTION

Telemedicine and Telehealth is the benediction of information and communication technologies (ICT) and is possibly the most prominent of e-business service that can have a major visible upshot on the development of our society. As fear grows among people over the fast transmission of deadly coronavirus and taking treatment going to a doctor or hospital has become riskier for all kinds of patients, including the COVID-19 ones, telemedicine services have appeared as a solution amid the pandemic crisis.[1] The infrastructure for telemedicine services is being developed in the country amid the outbreak of novel coronavirus pandemic as different government and non-government institutions and voluntary groups have come up with healthcare services through virtual platforms.[2]

Essentially, it is an approach to bridge the gap between two geographic locations and enable effective medical diagnosis. Though telemedicine is a new buzzword in Bangladesh, it is widely used in developed countries. The demand for specialized doctors is not being met in Bangladesh. Nowadays, the lack of healthcare provision in rural areas is putting stress on the already strained urban healthcare services, with the rural population flocking to the cities to avail medical service. However, the country's best doctors generally prefer to practice either in Dhaka or Chittagong, which results in the people living in rural areas not being able to access them. That's why our government is trying to promote and mainstream the use of telemedicine to improve access to medical service provision.[3]

## AN OVERVIEW OF TELEMEDICINE AND TELEHEALTH

Telehealth is sometimes discussed interchangeably with telemedicine. The Health Resources and Services Administration distinguishes telehealth from telemedicine in its scope, defining telemedicine only as describing remote clinical services, such as diagnosis and monitoring, while telehealth includes preventative, promotive, and curative care delivery.[4] This includes the above-mentioned non-clinical applications, like administration and provider education.[5,6]

The United States Department of Health and Human Services states that the term telehealth includes "non-clinical services, such as provider training, administrative meetings, and continuing medical education", and that the term telemedicine means "remote clinical services".[7] The World Health Organization uses telemedicine to describe all aspects of health care including preventive care.[8] The American Telemedicine Association uses the terms telemedicine and telehealth interchangeably, although it acknowledges that telehealth is sometimes used more broadly for remote health not involving active clinical treatments.[9] eHealth is another related term, used particularly in the U.K. and Europe, as an umbrella term that includes telehealth, electronic medical records, and other components of health information technology.[10]

## TELEHEALTH

The term telehealth includes a broad range of technologies and services to provide patient care and improve the healthcare delivery system as a whole. Telehealth is different from telemedicine because it refers to a broader scope of remote healthcare services than telemedicine. While telemedicine refers specifically to remote clinical services, telehealth can refer to remote non-clinical services, such as provider training, administrative meetings, and continuing medical education, in addition to clinical services. According to the World Health Organization, telehealth includes, "Surveillance, health promotion and public health functions." Telehealth is a subset of E-Health, which includes the delivery of health information, for health professionals and health consumers, education and training of health workers and health systems management through the internet and telecommunications.[11]

## TELEMEDICINE

Telemedicine is a subset of telehealth that refers solely to the provision of health care services and education over a distance, through the use of telecommunications technology. Telemedicine involves the use of electronic communications and software to provide clinical services to patients without an in-person visit. Telemedicine technology is frequently used for follow-up visits, management of chronic conditions, medication management, specialist consultation and a host of other clinical services that can be provided remotely via secure video and audio connections. Just to throw another term into the mix, we should note that the WHO also uses the term "telematics." According to them, "Telematics for health is a composite term for both telemedicine and telehealth, or any health-related activities carried out over distance by means of information communication technologies."[11]

## A BRIEF HISTORY OF TELEMEDICINE

The development and history of telehealth or telemedicine (terms used interchangeably in literature) is deeply rooted in the history and development in not only technology but also society itself. Humans have long sought to relay important messages through torches, optical telegraphy, electroscopes, and wireless transmission. Early forms of telemedicine achieved with telephone and radio have been supplemented with video-telephony, advanced diagnostic methods supported by distributed client/server applications, and additionally with tele-medical devices to support in-home care.[12] In the 21st century, with the advent of the internet, portable devices and other such digital devices are taking a transformative role in healthcare and its delivery.[13]

### Earliest Instances

Although, traditional medicine relies on in-person care, the need and want for remote care has existed from the Roman and pre-Hippocratic periods in antiquity. The elderly and infirm who could not visit temples for medical care sent representatives to convey information on symptoms and bring home a diagnosis as well as treatment.[13] In Africa, villagers would use smoke signals to warn neighbouring villages of disease outbreak.[14] The beginnings of telehealth have existed through primitive forms of communication and technology.[13]

### 1800s to Early 1900s

As technology developed and wired communication became increasingly commonplace, the ideas surrounding telehealth began emerging. The earliest telehealth encounter can be traced to Alexander Graham Bell in 1876, when he used his early telephone as a means of getting help from his assistant Mr. Watson after he spilt acid on his trousers. Another instance of early telehealth, specifically telemedicine was reported in The Lancet in 1879. An anonymous writer described a case where a doctor successfully diagnosed a child over the telephone in the middle of the night.[13] This Lancet issue, also further discussed the potential of Remote Patient Care in order to avoid unnecessary house visits, which were part of routine health care during the 1800s.[13,15] Other instances of telehealth during this period came from the American Civil War, during which telegraphs were used to deliver mortality lists and medical care to soldiers.[15]

From the late 1800s to the early 1900s the early foundations of wireless communication were laid down.[13] Radios provided an easier and near instantaneous form of communication. The use of radio to deliver healthcare became accepted for remote areas.[13,16] The Royal Flying Doctor Service of Australia is an example of the early adoption of radios in telehealth.[14]

In 1925 the inventor Hugo Gernsback wrote an article for the magazine Science and Invention which included a prediction of a future where patients could be treated remotely by doctors through a device he called a "tele-dactyl". His descriptions of the device are similar to what would later become possible with new technology.[17]

**Mid-1900s to 1980s**

When the American National Aeronautics and Space Administration (NASA), began plans to send astronauts into space, the need for Telemedicine became clear. In order to monitor their astronauts in space, telemedicine capabilities were built into the spacecraft as well as the first spacesuits.[13,16] Additionally, during this period, telehealth and telemedicine were promoted in different countries especially the United States and Canada.[13]

In 1964, the Nebraska Psychiatric Institute began using television links to form two-way communication with the Norfolk State Hospital which was 112 miles away for the education and consultation purposes between clinicians in the two locations.[18] The Logan International Airport in Boston established in-house medical stations in 1967. These stations were linked to Massachusetts General Hospital. Clinicians at the hospital would provide consultation services to patients who were at the airport. Consultations were achieved through microwave audio as well as video links.[13,18]

In 1967, one of the first telemedicine clinics was founded by Kenneth Bird at Massachusetts General Hospital. The clinic addressed the fundamental problem of delivering occupational and emergency health services to employees and travellers at Boston's Logan International Airport, located three congested miles from the hospital. Over 1,000 patients are documented as having received remote treatment from doctors at MGH using the clinic's two-way audio-visual microwave circuit.[19] The timing of Bird's clinic more or less coincided with NASA's foray into telemedicine through the use of physiologic monitors for astronauts.[20]

In 1972 the Department of Health, Education and Welfare in the United States approved funding for seven telemedicine projects across different states. This funding was renewed and two further projects were funded the following year.[13,18]

**1980s to 1990s: Maturation and Renaissance**

Telehealth projects underway before and during the 1980s would take off but fail to enter mainstream healthcare.[14,16] As a result, this period of telehealth history is called the "maturation" stage and made way for sustainable growth.[13] Although State funding in North America was beginning to run low, different hospitals began to launch their own telehealth initiatives. NASA provided an ATS-3 satellite, to enable medical care communications of American Red Cross and Pan American Health Organization response teams, following the 1985 Mexico City earthquake. The agency then launched its Sate-Life/Health-Net programme to increase health service connectivity in developing countries. In 1997, NASA sponsored Yale's Medical Informatics and Technology Applications Consortium project.[16]

Florida first experimented with "primitive" telehealth in its prisons during the latter 1980s.[21] Working with Doctors Oscar W. Boulting house and Michael J. Davis, from the early 1990s to 2007; Glenn G. Hammack led the University of Texas Medical Branch (UTMB) development of a pioneering telehealth program in Texas state prisons. The three UTMB alumni would, in 2007, co-found telemhealth provider NuPhysician.[22]

The first interactive telemedicine system, operating over standard telephone lines, designed to remotely diagnose and treat patients requiring cardiac resuscitation (defibrillation) was developed and launched by an American company, Med-Phone Corporation, in 1989. A year later under the leadership of its President/CEO S Eric Wachtel, Med-Phone introduced a mobile cellular version, the MD-Phone. Twelve hospitals in the U.S. served as receiving and treatment centers.[23]

**2000s to Present**

The advent of high-speed Internet, and the increasing adoption of ICT in traditional methods of care, spurred advances in telehealth delivery.[24] Increased access to portable devices, like laptops and mobile phones, made telehealth more plausible; the industry then expanded into health promotion, prevention and education.[4,25]

In 2002, Dr G. Byron Brooks, a former NASA surgeon and engineer who had also helped manage the UTMB Telemedicine program, co-founded Teladoc in Dallas, Texas, which was then launched in 2005 as the first national telehealth provider.[21]

In the 2010s, integration of smart home telehealth technologies, such as health and wellness devices, software, and integrated IT, has accelerated the industry. Healthcare organizations are increasingly adopting the use of self-tracking and cloud-based technologies, and innovative data analytic approaches to accelerate telehealth delivery.

In 2015, Mercy Health system opened in Mercy Virtual, in Chesterfield, Missouri, as the world's first medical facility dedicated solely to telemedicine.[23]

## APPLICATIONS OF TELEMEDICINE

Telehealth applications include

- **Live (synchronous) video-conferencing:** a two-way audio-visual link between a patient and a care provider
- **Store and forward (asynchronous) video-conferencing:** transmission of a recorded health history to a health practitioner, usually a specialist.
- **Remote patient monitoring (RPM):** the use of connected electronic tools to record personal health and medical data in one location for review by a provider in another location, usually at a different time.
- **Mobile health (m-Health):** health care and public health information provided through mobile devices.

The information may include general educational information, targeted texts, and notifications about disease outbreaks.

- **Follow-up visits:** Using health software for routine follow-up visits is not only more efficient for providers and patients, but it also increases the likelihood of follow-up, reducing missed appointments and improving patient outcomes.
- **Remote chronic disease management:** The increasing rate of chronic disease is a major challenge for our health system. It is a prime candidate for the use of telemedicine software because it makes it easier and less expensive for patients to maintain control over their health.
- **Remote post-hospitalization care:** One telehealth program for patients with congestive heart failure reduced 30-day hospital readmissions by 73 percent and six-month readmissions by 50 percent.
- **Preventative care support:** Weight loss and smoking cessation are the keys to reducing heart disease and a host of other conditions. Telemedicine can be a valuable tool in connecting providers with patients to make sure they get the support they need to be successful.
- **School based telehealth:** When children become ill at school, they might visit a school nurse or be picked up by their parents and taken to an urgent care centre. Some innovative districts have teamed up with doctors to conduct remote visits from the school. The provider can assess the urgency of the case and provide instructions or reassurance to parents.
- **Assisted living centre support:** Telemedicine software has already proven to be useful in keeping residence of assisted living facilities out of the hospital. Problems often occur at night or on weekends, making hospitalization the only option even for less urgent problems. With telemedicine, on-call doctors can conduct a remote visit to determine if hospitalization is necessary.[11]

Telemedicine was shown to be helpful in previous outbreaks, including former coronavirus outbreaks such as SARS-CoV (severe acute respiratory syndrome–associated coronavirus) and MERS-CoV (Middle East respiratory syndrome coronavirus), or PHEICs related to Ebola and Zika viruses. Most countries, however, lack a regulatory framework to authorize, integrate, and reimburse telemedicine in their care delivery for all patients, particularly in emergency and outbreak situations. Two possibilities are currently available for patients.

**(1)** direct-to-consumer telemedicine with private providers mostly relying on out-of-pocket or private insurance payment and.

**(2)** free solutions, mainly from country-based companies that may not respect national health data privacy and security requirements.

Although these solutions may be useful to support and alleviate the pressure on health care systems during the outbreak, to date, they are mostly unintegrated within national health care systems and not sharing data with public health authorities for epidemiological surveillance.

## TELEMEDICINE DURING THE COVID-19 OUTBREAK

As previously stated, telemedicine is a subset of health that allows medical professionals to offer clinical services to patients at a distance. During the COVID-19 outbreak this has become extremely important. First, using Telehealth when possible can help limit the spread of coronavirus by keeping people away from clinics and in their homes. This will allow doctors the ability to see and communicate with their patients, without the unnecessary risk of exposure to the corona virus. For example, many providers are using Telehealth services for counselling appointments, physicals or other appointments in which in person interaction is not essential. This allows physicians to reach more patients and also limit exposure to the virus.[26]

## VIRTUAL HEALTH CARE IN THE TIME OF COVID -19

With the second largest burden of COVID-19 in the world, Italy does not include telemedicine in the essential levels of care granted to all citizens within the National Health Service. No formal input was given on telemedicine by health authorities, despite high pressure on health services during the first phase of the epidemic; not until an open call for telemedicine and monitoring system technologies proposals on March 24th was jointly issued by the Ministry for Technological Innovation and Digitalization, the Ministry of Health, the National Institute of Health and the WHO.

In France, the Ministry of Health signed a decree on March 9, 2020, allowing the reimbursement of video teleconsultations and tele-expertise by the National Health Insurance (NHI), for patients with COVID-19 symptoms and those confirmed with COVID-19 throughout the country, without the need to know the patient beforehand. The decree was aimed to decrease unnecessary travel for medical consultations, limit the number of individuals grouping in waiting rooms, screen and detect suspected patients, and allow follow-up of mild confirmed cases from home.[27]

Bangladesh Garment Manufacturers and Exporters Association (BGMEA) and Common Health Bangladesh have signed an agreement to provide free telemedicine service to one lakh garment workers. Common Health will provide up to one lakh workers with a free phone-based consultation with MBBS doctors covering queries relating to primary health care, mental health, and COVID-19, according to apex body of the country's apparel industry.[28] The Government republic of Bangladesh launched 3 tele-communication sites of

health-care purposes during COVID-19 outbreak. Up to 31 May, 2020 about 4202464, 4182505 and 245003 calls have been received over "16263", "333" and by "IEDCR" respectively regarding COVID-19 related problems.[29] **(Figure 01)**.

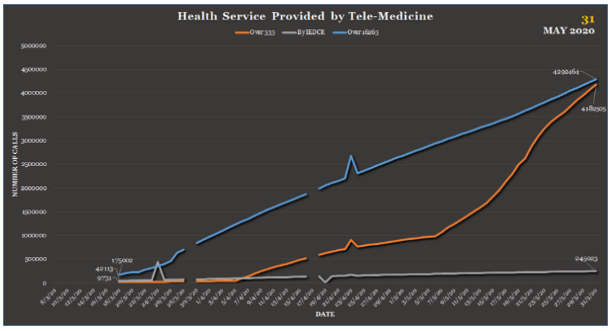


**Figure 1: Health service Provided by Tele-Medicine in Bangladesh during COVID-19 Outbreak.**

## BENEFICIARY EFFECTS OF TELEMEDICINE

### How Telemedicine Benefits Providers

Healthcare systems, physician practices, and skilled nursing facilities are using telemedicine to provide care more efficiently. Technologies that comes integrated with telemedicine software like electronic medical records, AI diagnosis and medical streaming devices, can better assist providers in diagnosis and treatment. The latter allows providers to monitor patients in real-time and adjust treatment plans when necessary. Ultimately, this leads to better patient outcomes.

Providers can also benefit from increased revenue. By utilizing telemedicine, physicians can see more patients without the need to hire more staff or increase office space.[30]

### How Telemedicine Benefits Patients

Because of telemedicine, patients who previously had limited access to health care services can now see a physician without leaving their home. Seniors who would prefer to age in place can now do so with the use of medical streaming devices. The spread of disease is reduced as individuals with contagious diseases don't have to expose it to others in crowded waiting rooms.

Telemedicine also benefits patients in the following ways.

- **Better Access to Health Care:** It makes easier for people with disabilities to access care.
- **Cost Effective:** Most benefits for an employer providing telehealth is the reduction in cost for healthcare services. The vast majority of emergency room are unnecessary and costly to employers. **Reduced Absenteeism of employees:** Telemedicine could also potentially boost productivity and reduce absenteeism of employees.
- **Convenience:** A person does not have to take time off of work or arrange childcare.
- **Reducing the spread of infection:** Telemedicine eliminates the risk of picking up an infection at the doctor's office.
- **Transportation:** Patients can save vehicle's cost or wasting time in traffic with video consultations.[30]

## DISADVANTAGES OF TELEMEDICINE

Although telemedicine brings with it many benefits, there are some downsides to it as well. Providers, payers, and policymakers alike know that there are some grey areas that are difficult to keep up with. While the field will grow exponentially over the next decade, it will bring with it both practical and technological challenges.

### Unclear Policies

Because technology is growing at such a fast pace, it's been difficult for policymakers to keep up with the industry. There is great uncertainty regarding matters like reimbursement policies, privacy protection, and healthcare laws. In addition, telemedicine laws are different in every state.

There are currently 29 states with telemedicine parity laws, which require private payers to reimburse in the same way they would for an in-person visit. As additional states adopt parity laws, private payers may institute more guidelines and restrictions for telemedicine services. Although it's a step in the right direction, there is still uncertainty regarding reimbursement rates, billing procedures, and more.[30]

### Fewer Face-to-Face Consultations

Several physicians and patients are finding it difficult to adapt to telemedicine, especially older adults. Physicians are very concerned about patient mismanagement. While advances in medicine have made it more efficient to use technology, there are times when system outages occur. There is also the potential for error as technology cannot always capture what the human touch can.[30]

### Technology Is Expensive

Healthcare systems that adopt telemedicine solutions can attest that it requires a lot of time and money. Implementing a new system requires training and sometimes staff members find it difficult to welcome this change. Practice managers, nurses, physicians, and more have to learn how to utilize the system so that practices can see the benefits. Although telemedicine is expensive in the beginning, healthcare systems should see a positive return on investment over time due to more patients and less staff.[30]

For healthcare organizations and most patients alike, the future of telehealth is bright and exciting. Once we overcome the legal and reimbursement obstacles, telemedicine will be able to flourish nationwide.

## THE FUTURE OF TELEMEDICINE

Annually, millions of Americans receive care using telemedicine solutions and the numbers are increasing.

With more patients using the service and more physicians offering it, telemedicine has no choice but to expand. Here is what the future of telehealth looks like.

**Online Medical Centers**
Imagine a 24/7 online collaborative platform for patients, providers, and staff. The future of telehealth may look like a group of remote physicians treating hospitalized patients from all over the state. With digital monitoring devices and video conferencing, physicians can treat and diagnose more patients in less time.

**Telemedicine Across Borders**
With technology becoming more robust, the future of telehealth could include international collaboration. Some countries offer medical advances that the United States does not have readily available (and vice versa), but telemedicine would lessen the barriers.

**Great Acceptability**
As patients experience the reduced wait times and greater access to care, the hesitation regarding telemedicine will decrease. Physicians will also notice better patient outcomes and more revenue without an increased workload. In addition, private payers, Medicaid, and Medicare will respond to the demand after solidifying best practices.

**Health System Collaboration**
Today, it is still difficult to share electronic medical record information with a health system that uses another EMR platform. The future of telehealth will likely include enhanced sharing capabilities that will allow for patients to adequately care for no matter where they are.

In addition, experts predict that the electronic medical record will become more seamless and allow for advanced automated patient billing.

**Augmented Reality Mirrors**
The future of telehealth likely includes augmented reality mirrors. The system will combine augmented reality and adaptive image transformation for diagnostics and patient monitoring. With better imaging provided by augmented reality mirrors, providers can better diagnose eye problems, skin problems, and even breast cancer.[30]

## NON-GOVERNMENT TELEMEDICINE SERVICE IN BANGLADESH

Praava Health introduced several new telemedicine options in response to the COVID-19 pandemic for all Patients and the broader community. These services include a dedicated COVID-19 hotline and video consultations with Praava's doctors so Patients can access health services without leaving the safety of their homes and reduce further transmission of the virus.[31]

Dhaka University (DU) has launched free telemedicine service for the people in the wake of deadly novel coronavirus (COVID-19) outbreak. Department of Biomedical Physics and Technology of the university introduced the service. Private IP telephone company 'Bd-com' has facilitated the auto-hunting telephone service in this regard.[32]

## CONCLUSIONS

All stakeholders are encouraged to address the challenges and collaborate to promote the safe and evidence-based use of telemedicine during the current pandemic and future outbreaks. For countries without integrated telemedicine within their national health care system, the COVID-19 pandemic is a call to adopt the necessary regulatory changes supporting wide adoption of telemedicine.

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