



Implementation and Usefulness of Telemedicine Services in the Healthcare System of Pakistan

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ABSTRACT

Telemedicine, also known as telehealth or e-health, is the remote delivery of healthcare services over the telecommunications infrastructure. It allows healthcare providers to evaluate, diagnose and treat patients without the need for an in-person visit. Pakistan is a developing nation with its population majorly concentrated in rural areas which lack adequate high quality healthcare services and patient care. Telemedicine has the potential to surpass many barriers that hinder the healthcare delivery in these remote and rural areas. However, Pakistan hasn't been able to achieve significant benefit from these e-health advancements due to lack of adequate guidelines, laws or policies needed for e-health to properly work here and due to a lack of government's interest. There are many barriers to implementation of e-health in Pakistan with very low literacy rate being the major one. Other barriers include high budget requirements and limited access to internet and technology in remote and rural areas of the country. Apart from these barriers, there are many challenges that the patients and doctors face dealing with telemedicine. In order to achieve significant benefit from these e-health technologies in Pakistan, it is also necessary to increase the knowledge of it in both patients and doctors. More workshops and training programs should be arranged to teach doctors about the telemedicine technology and proper telemedicine guidelines should be made and regulated by higher authorities.

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HEALTHCARE SYSTEM OF PAKISTAN

Government Spending on the Healthcare Sector

According to the 2019 Global Health Security Index, Pakistan ranks 167th out of 195 countries in regards to their overall healthcare system and healthcare capacities in terms of the number of hospitals, clinics, and care centers that offer medical services to the population [1]. The main financial source of healthcare facilities in Pakistan is the government [2]. According to the World Health Organization Global Health Expenditure database from 2018, The United States spend 16.89% of its GDP on healthcare [3]. As of 2019, the United States government has increased its spending in the healthcare services by 4.6%, spending on a total of 17.7% on healthcare sector [4]. In contrast, Pakistan spent 3.2 % of its total GDP on healthcare. As can be seen in Table 1, the current health expenditure of different regions in the world varies. North America and Europe spent a higher percentage of GDP on healthcare, whereas

Table 1: Current Health Expenditure (% of GDP) (3).

Region	Most Recent Value	Most Recent Year
North America	16.42	2018
Europe and Central Asia	9.3	2018
Middle East and North Africa	5.83	2018
Sub-Saharan Africa	5.09	2018
United Arab Emirates	4.23	2018
South Asia	3.48	2018
Pakistan	3.2	2018

the South Asian countries spent the least amount of GDP on healthcare [3].

Medical Capacity of Pakistan

The healthcare system of Pakistan consists of public sectors and private sectors. Since the private sectors consist of a higher quality of healthcare services and patient care, they cater to 70% of the population [5]. By the end of 2017, Pakistan had a population of 207 million people [6]. This large population overwhelmed the already overburdened health care system, which comprises of limited healthcare professionals, hospitals, and medical centers. Table 2 shows the total number health institutions, beds, and registered doctors that were available in Pakistan by the end of 2017. The ratio of doctor-to-patients was about 1:997, dentist-to-patient 1: 10658, and hospital bed-to-patient 1:1584 [6]. As can be seen, the medical capacity to offer adequate medical services of the country is very low especially in comparison to the extremely large population they have to provide services for.

Pakistan's healthcare system lacks necessary policies and regulations to make it function more efficiently and cater to such a large and rapidly growing population. Along with

the lack of adequate funding, Pakistan's underdeveloped healthcare system also lacks structure, unequal distribution of healthcare professionals and services, limited access to high quality patient care and medical services [2].

Causes of Poor Healthcare In Rural Areas of Pakistan

The basic structure of Pakistan's healthcare comprises of rural health centers, basic health units, tehsil headquarter hospitals, district headquarters hospitals and teaching hospitals [7]. Pakistan is a very populated country with major disparity in its delivery of health care services to populations in urban areas versus the populations in rural areas. As of September 12, 2021, Pakistan's total population is 226,002,908 people. Out of the total population 35.1% of the population lives in urban areas [8], while more than 63% of the population lives in rural areas [9]. While the majority of the population lives in small towns and villages, most healthcare facilities and medical services are present in the urban areas of the country.

Rural areas of the countries face many difficulties which make it harder to administer proper healthcare services there. There is a lack of infrastructure, logistical difficulties, lack of proper roads and transport that make it harder to travel to and provide healthcare in these remote and rural areas [10]. There is only a limited number of healthcare facilities and insufficient services available in these areas. The ratio of hospital beds in rural areas to urban areas is 18% to 82% [7]. There is also limited opportunities to progress, which discourages doctors from working in these areas [2]. Out of the total percentage of licensed doctors in the country, only 22% of physicians work in rural areas [7]. Hospitals are therefore always under-staffed and overburdened [2]. There is limited to no supervision of practicing physicians in these areas in order to check and confirm their medical qualifications and the quality of healthcare services they provide. Since there is an absence of qualified doctors, it gives room for practitioners of traditional medicines and quacks [2] to offer medical assistant to the patients, even if

Table 2: Health Facilities in Pakistan.

Health Manpower	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Registered Doctors	152368	160880	167759	175223	184711	195896
Registered Dentists	11649	12692	13716	15106	16652	18333
Registered Nurses	77683	82119	86183	90276	94766	99228
Population per Doctor	1162	1123	1099	1073	1038	997
Population per Dentist	15203	14238	13441	12447	11513	10658
Population per Bed	1647	1616	1557	1591	1604	1584

Source: Pakistan Bureau of Statistics

they don't have adequate medical training.

TELEMEDICINE

Pakistan is a developing nation with a majority of its population concentrated in rural area. These villages and towns lack adequate high-quality healthcare services and patient care that can cater to this large population, due to limited resources, lack of experienced physicians, and large distances and poor infrastructure that would allow travel to these areas. These areas lack an efficient healthcare delivery system. However, due to the rapid development and growth of Information and Communication Technology (ICT) around the world e-Health or Telemedicine has become a possibility. The use ICT to deliver healthcare services to remote, rural, or inaccessible parts of the nation, is called Telemedicine [11]. In the past decade, there have been major advancements in ICT in terms of mobile subscriptions and internet users.

Benefits of Telemedicine

Telehealth is changing the systems of care all around the world, especially in developing countries since it permits remote and rural areas get access of healthcare and create knowledge locally. It delivers more access to healthcare facilities and consultations with experienced physicians that are usually present in the urban areas of Pakistan. It also allows for as sharing knowledge, experience, and training [12]. Telemedicine is a cost-effective and more efficient solution to fulfil the basic health needs of populations that have limited access to medical care. Using the growing Information and Communication Technologies, such as Internet monitoring, online patient reminder, text messages, e-mail reminders, telemedicine allows for the diagnosis and treatment of patients residing in rural areas of the country. The system of healthcare delivery also allows patients to evade long and difficult travelling to distant hospitals and clinics and decreases costs and time of travelling. The use of this technology gives the rural population of the country the same access to medical care and health resources that are available to patients in urban areas, without having to travel long distances [13]. The poorer populations of the country have access to cheaper and more affordable consultations in less time, as well has more options of picking their choice of specialist doctor, or male or female doctors [14]. Telemedicine also reduces long queues and waiting for doctors, which allows for faster medical care as well as reduced squandered times. Interactive video call sessions with physicians, email communication, and online consultations also potentially decrease anxiety that most patients feel during in-person visits [10].

Not only does telemedicine aid in the delivery of first and efficient medical aid, but it also has potential benefits in the long run. Since telemedicine allows for early intervention by

cutting travelling and waiting times, it allows early diagnosis of disease, prevention of development of chronic diseases, and reduces the number of undue emergency department visits. This is very important since delayed diagnosis and late interventions can cause further complications in patients that could have easily been avoided in the first place [10]. Telemedicine also has the potential to control the spread of many epidemic diseases that are prevalent in the country through effective surveillance [14].

Chronic disease and poverty are connected in a cycle since poverty is a risk factor for developing chronic diseases, and then treatment and medications of these chronic diseases leads to further poverty [15]. Populations that live in remote and rural areas of low-income and middle-income countries (LMICs) are more effected by this vicious cycle. According to the World Health Organization, about 80% of deaths because of chronic disease occurs in these LMICs. Due to high poverty rates, extensive travel time to access healthcare facilities, socio-political stability, these population face missed opportunities of primary prevention which causes their medical conditions to progress to chronic diseases with poor prognosis. Telemedicine offers an opportunity to improve the healthcare access to these areas where populations have higher rates of morbidity and mortality [15].

GOVERNMENT REGULATION OF TELEMEDICINE IN PAKISTAN

The World Health Organization (WHO) conducted a survey in 2016, which revealed that Pakistan did not have adequate telemedicine laws or regulations that would allow telemedicine to work properly [2]. There are no guidelines or policies that state what kind of government or department approvals are needed to launch a telemedicine or e-health program [2]. In contrast, about 55% states around the world have a properly designed and implemented e-health policies [16]. Due to the lack of government interest and absence of a regulatory framework, it is hard for new companies, especially large international corporations, to start cost-effective telemedicine programs in Pakistan. Healthcare is regulated at the provincial level of the government. Most provincial health department officials lack proper knowledge on the existence or benefits of telemedicine. Telemedicine has been mentioned in a very vague context in the Pakistan Medical and Dental Council (PMDC) code of ethics, which is dating back to 1970 [2].

There are major legal obstacles to consider as well. There are no major policies or laws that protect patient's privacy and confidentiality, especially when it comes to personal data that is recorded in electronic medical records. In contrast, 70% of states worldwide have legislations that protect patient records. There is also a lack of an official legal framework to allow health professionals to provide

healthcare services to patients in different countries and jurisdictions [16].

BARRIERS TO TELEMEDICINE UPTAKE/IMPLEMENTATION

Telemedicine has the potential to surpass many barriers that hinder healthcare delivery in remote and rural areas of the countries. However, Pakistan has not been able to achieve significant benefit from these e-Health advancements [2] due socioeconomic, geographic and political challenges [17] that lead to problems in implementing the system efficiently. There are many factors that pose a challenge for the advancement and effective impact of telehealth in Pakistan. One major factor that impedes the day-to-day operation of telehealth services in the low literacy rate of the population. As on 2017, Pakistan's literacy rate in 15-years and older was 59.1% and 65 years and older was 27.1% [18]. This signifies that almost half the population is illiterate and therefore relevant education and training of the personnel is crucial. However, there is an absence of investors who would be willing to support this education initiative [19].

Another major barrier to implement e-Health services in Pakistan is the limited access to internet and technology in remote and rural areas of the country (20). Due to the constraints in resources, Pakistan struggles to provide access to smartphones and high-speed internet access to two-thirds of the population [21]. Out of a total population of 207 million, Table 3 shows the number of people who have subscriptions and access to phone and internet services [22].

The current infrastructure of the country has limitations which include not being able to support large data sets, replace old gadgets due to high costs, and there are no available tools for natural language processes so that local languages can be translated, making communication easier between people of different regions of the country [21]. There are major linguistic and cultural differences between patients, especially from underserved remote areas of Pakistan, and the service providers which are mainly concentrated in the urban areas of the countries [16]. Improper communication between the two can lead to difficulty in providing patient care. In order to successfully

Table 3: Pakistan Telecommunication Authority (updated Aug 2021) (22).

	Number of Subscribers
Cellular Subscribers	186 million
3G/4G subscribers	103 million
Basic Telephony Subscribers	2 million
Broadband Subscribers	106 million

implement and establish technological-based interventions, there are high budget requirements. Firstly, there are high costs associated with creating the infrastructure and technology required to allow telemedicine to work, which include different softwares, servers, and programs. This is especially difficult for countries such as Pakistan that are under-budgeted and don't receive much funding in their health or technology sectors. Secondly, there are high costs associated with human resources and training the workforce to work with this new technology [21]. This is necessary to rectify any malfunctions that can occur due to technological malfunctions, which can lead to the wrong diagnosis and treatment of a patient [19]. There are many professionals from different backgrounds, such as IT, engineering, public and digital health, who are working together to implement telemedicine technology throughout the country. Although the aspiring innovation, many face challenges and difficulties with implementation and acceptance. One main obstacle to overcome in Pakistan is the patentability of telemedicine and meeting its requirements and criteria. Moreover, the lack of a regulatory framework which can help motivate the process through improvements and monitoring process parameters hinders the operation into completion. Minimal deployment of health applications and other advanced digital tools in current clinical practices seem unavailable with lack of evidence that may prove the validity and acceptability of digital health devices and smartphone gadgets and online applications which telemedicine entails. Above all, is the issue with a great communication gap between multiple partners and stakeholders (such as technology entrepreneurs, investors, developers, researchers, and practicing physicians). This is due mainly to a complex web of experts involved in digital health projects from diverse multiple domains. One such study showed that more clinical professionals were only involved and interested in the implementation phase of the telemedicine project without much representation in the input stages at the planning and initiation phases of the interventions [21].

PATIENT CHALLENGES AND PERCEPTIONS TOWARD THE USE OF TELEMEDICINE

There are some challenges that the patient faces with dealing with telemedicine, which include limited access to technology, difficulty in the acceptance of the technology, relationship with the healthcare provider, and level of health literacy [17]. Patients living in rural remote areas don't have adequate ICT infrastructure, and therefore they are more unfamiliar with telemedicine technology. Since they don't understand how the technology works, they may be skeptical and hesitant in accepting telemedicine as an effective healthcare service [13]. Diagnosis and treatment of a medical condition is a complicated process, which may be difficult for patients to comprehend. However, during in-person visits, patients are able to ask questions and discuss

their treatment plan. Online consultations also don't allow for physical examinations, which can lead to the physician missing an important finding or sign that is important for proper diagnosis [17]. This makes people more susceptible to traveling large distances to go to in-person clinics instead of using telemedicine. Most people value their own health over saving time and money traveling to far away hospitals by using telemedicine [13].

Patient's perceptions towards telemedicine are crucial to its success. A study was conducted where a total of 251 patients answered a telemedicine questionnaire. The study revealed that gender, age, and education were important determining factors in the use of telemedicine technology. People who were more educated were able to use the technology more easily. The use of telemedicine in the future was mainly determined by age and education. 61.35% of patients did not require assistance in using telemedicine technology, and 96.4% of patients stated that telemedicine reduced their travel time [23].

The use of telemedicine was also linked with the covid-19 epidemic. A study was conducted which showed that majority of telemedicine calls and consultations were done during the covid-19 lockdown, emphasizing on the fact that the need of telemedicine is essential where movements are restricted and people can't get to far away healthcare facilities. As the lockdown was alleviated, telemedicine services decreased since more patients preferred to go to in person healthcare facilities [20].

KNOWLEDGE/ ATTITUDE OF TELEMEDICINE AMONG DOCTORS IN PAKISTAN

There are many challenges that doctors face in terms of practicing telemedicine in Pakistan. Physicians have to learn and practice "no-touch medicine". They have developed certain instincts and skills when seeing a patient in person and diagnosing them based on their physical examination and the signs and symptoms are present right in front of the

Table 4: Barriers to practice of telemedicine in first-world and third-world countries as perceived by the doctors.

Barriers faced in practice of telemedicine according to the doctors	First world countries	Third world countries
Physician licensing	58.90%	40.60%
Insufficient profits and reimbursements	21.40%	78.60%
Poverty/Lack of education	9.40%	90.60%
Lack of internet connections	10.30%	89.70%

doctors. This might all be lost during an online visit, so doctors have to find a new way to practice medicine and help these patients. Physicians also have to learn to manage their time efficiently since telemedicine consultations are not less time consuming for doctors. The doctor patient conversation changes from open ended questions to more focused questions, which might cause the interaction between the doctor and patient to be impersonal [17]. Doctors also have to learn the new technology that comes with telemedicine. They need adequate training for this new way of practicing medicine. However, a study conducted showed that majority of the doctors in Pakistan complained that there was a lack of telemedicine workshops [10]. Storage and access of data, and maintaining the privacy of the patient will also need to be done in order for telemedicine to be a success [17]. Table 4 shows the percentage of doctors who believed which obstacles or issues make the practice of telemedicine difficult in first world and third world countries [10] Table 4.

A study was conducted in order to understand the knowledge and attitude among doctors in Karachi, Pakistan regarding telemedicine. 98.2% of doctors stated that no telemedicine meetings, conferences, or workshops were done in the workplace, leading to inadequate awareness and understanding of the applications of telehealth. Out of 125 house officers, 104 (83.2%) knew the correct meaning of telemedicine. From their own respective total pools, 82.7% general physicians, 70.9% specialists, and 83.3% consultants knew the correct meaning of telemedicine. Many specialists believed that telemedicine is a consultation between doctors over the phone. Many healthcare professionals believe that telemedicine is valuable in reducing avoidable transportation costs and hospitals bills for patients with mild medical problems who can easily be treated at home through online consultations. 28.1% of doctors believed that telemedicine allows physicians to provide faster medical assistance to patients and 23.2% of doctors believed that telemedicine will decrease "white coat syndrome" that patients develop during in person visits [10].

Physicians around the world still have concerns regarding the protection of patient's private information and medical records with telemedicine. Private patient information can be misused if unauthorized persons get access to it. 42.9% of doctors think that telemedicine has the potential of disrupting the doctor-patient relationship and cause a breach in the privacy of the patient [10].

CONCLUSION

In order to successfully implement telemedicine in Pakistan's healthcare sector, it is important to first establish the attitudes of healthcare professions and patients towards e-Health technology. Studies and surveys need to be conducted to determine the attitude, knowledge, and practices among healthcare workers in regards to

telemedicine as well as establish workshops and training programs to teach doctors and consultants about the latest advances in telemedicine technology. Local telemedicine guidelines need to be established and regulated by higher authorities [10]. There is a gap in communication that exists between physicians, technological experts, and researchers, which prevents them from exchanging initiatives and ideas with each other. Therefore, it's important to integrate digital health in the already established healthcare system of Pakistan [21].

Typically, patients feel that by physically going to the doctor they will receive better treatment. If they have to pay the doctor consultation fee anyway, they feel their money is better spent when they get one-on-one time with their Doctor in person, rather than a quick phone call. It is crucial to educate individuals that a doctor is able to treat them through their history and symptoms as well as their lab results. Individuals must be taught how exactly telemedicine works and the process of getting a consultation should be made as simple as possible. Although some illness may require hospital visits, some illness can be diagnosed by seeing a health care professional online. A majority of the population especially the minorities don't even know tele-medicine exists. There should be facilities which call people directly to offer their tele-medicine services and talk a little bit about tele-medicine services work so people are more aware of them. These online services should be at a lower price to make individuals more inclined to getting them. Especially in these areas, word of mouth is very important. So, if some people have a positive experience with tele-medicine, the news will travel all around their neighborhoods.

A survey was conducted at different levels of the medical community and it showed how only a minority of the healthcare community understands the concept and application of telemedicine [2]. If used right, Telemedicine will allow technology-based interventions to be used more efficiently and to an extensive and socioeconomically diverse audience [21].

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