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### **Telemedicine: Bridging the Gap Between Healthcare Services and Rural Communities**

Every summer break, I travel to the outskirts of *Singamaneni Palli*, where I am greeted by my grandmother with big hugs and warm smiles. *Singamaneni Palli* appears to outsiders as a typical village, filled with lush green fields and where the cooing of roosters wakes villagers up at the crack of dawn. But in reality, Singamaneni Palli has been stuck in a vicious cycle of poverty for decades. One of the major problems facing the village is that of healthcare. With no hospital in the village, access to medical care in emergency situations is nearly impossible. The nearest hospital is more than 50 kilometers away in a neighboring village, but is often overcrowded with patients desperate for medical care and not enough doctors or resources to provide it.

Access to healthcare services remains a long-standing problem in many areas of the world. While efforts have been made to improve access to and affordability of healthcare services, there are still many communities, such as my grandmother's village, where progress is difficult to attain due to various social, economic and political circumstances.

Over the years, the development and advancement of new technologies has undoubtedly revolutionized accessibility to a wide range of healthcare services. In particular, the growing digital age in recent decades has enabled the integration of Telemedicine, which allows

healthcare providers to evaluate, diagnose, and treat patients using modern technology and telecommunications (Bashshur and Shannon 15). The evolving industry allows virtual communication between the patient and medical provider, thereby removing distance barriers and improving access to medical services that would otherwise not be available in remote, rural communities (Bashshur and Shannon 16).

### *Origins*

Although the field has evolved immensely over time, origins of Telemedicine date back to the invention of the telegraph and telephone in the early 19th century (Bashshur and Shannon 36). These inventions made long distance communication possible and more accessible to citizens for the first time. The telegraph, for instance, was used to order medical supplies and to communicate injuries and deaths on the battlefield during the Civil War. Additionally, the telegraph was used for medical consultations during emergency situations in the war. The invention of the telephone shortly after fostered an increased connectedness within the healthcare system. It allowed physicians to communicate medical information to patients directly over the phone, as well as consult with other physicians to share medical advice. Moreover, in 1968, 9-1-1 became the official emergency telephone number in the United States, providing fast and reliable access to emergency medical care (Bashshur and Shannon 42).

More advanced forms of modern Telemedicine began in 1924 with the publication of an article in *Radio News* magazine, introducing the use of television and microphone devices to allow long-distance communication between the patient and medical provider. In the late 1950's and early 1960's, physicians gained the capability to transmit complex medical information virtually. In 1959, for example, The University of Nebraska began to use telemedicine

techniques to send results of neurological tests directly to patients (Bashshur and Shannon 55).

The use of x-rays, electrocardiograms and radiology followed shortly after. Telemedicine reached new heights in the 1960's, when the National Aeronautics and Space Administration (NASA), Lockheed Corporation, and U.S. Indian Health Service collaborated on a project to provide easier access to healthcare services to an American Indian reservation using technologies and tools developed for astronomical purposes. This project marked a major breakthrough in the field of Telemedicine, as it was one of the first times Telemedicine was used to reach rural and underserved communities within the United States (Bashshur and Shannon 56).

The introduction of the Internet in the 1990s provided enhanced support for the advancement of Telemedicine. Growth of the Internet and web applications allowed for the implementation of healthcare software applications to store and organize clinical data. This led to an incentive by the U.S. government to transition to electronic medical records (EMRs) to create a more integrated healthcare system. Moreover, the Internet gave rise to patient web portals, where patients gained the ability to view their health records, send emails to their physicians and refill prescriptions (Bashshur and Shannon 98). In essence, the rise of the Internet fostered a more organized healthcare system and transformed patients' connectivity and involvement with the system as well.

Telemedicine has largely revolutionized the quality and standard of healthcare within the United States. However, in present day, the industry is increasingly being used to reach and aid underserved areas in many parts of the world where the lack of advanced medical services and supplies within their local communities makes it nearly impossible for patients to receive the care they require (Bashshur and Shannon 86). Advanced application development, digitization of

health information and the development of real-time audio and video consultations has enabled doctors to connect with patients across the world with ease. Moreover, the use of Telemedicine has also become popularized in rural communities, where the lack of infrastructure and access to healthcare facilities prevents patients from receiving adequate medical attention (Bashshur and Shannon 72).

With the global expansion of modern Telemedicine in the last few decades, it is important to consider the extent to which the system has transformed accessibility to medical services and improved standard of care. Rural and underserved areas are of particular interest, as these communities are the most impacted by the digitization of medicine. The implementation of telehealth clinics in several parts of the world reveal both the advantages and disadvantages of the system. While the integration of Telemedicine has enabled easier and faster access to healthcare services in areas where medical resources are scarce, the system also presents several communication barriers, ultimately providing an increased understanding of how technology can be both limiting and enhancing to the medical field in today's digital era.

### *Advantages*

There are several benefits to the implementation of Telemedicine in communities, including increased accessibility, improved outcomes, greater cost-effectiveness and a more globally connected healthcare system. A study by the University of Texas Medical Branch (UTMB) revealed the overwhelmingly positive impacts of the integration of Telehealth within underserved communities in Texas (UTMB Health 4). Texas is of particular interest in the study of the effects of Telemedicine due to large discrepancies in the distribution of healthcare resources to different parts of the state. In fact, according to the Statewide Health Plan

2011-2016 report by the Texas Statewide Health Council, there is only one physician per 573 country residents in metropolitan areas outside the border. UTMB has responded to these challenges by implementing innovative ways to digitize medical care. For instance, in 2009, telemedicine clinics were implemented specifically for children in rural Texas communities where pediatric psychiatric services are “limited, overburdened and scarce.” The availability of these clinics ultimately allowed patients who would have previously not been able to receive psychiatric care from a trained child psychiatrist, access to such services. In a survey of parents whose children received pediatric telepsychiatry care from UTMB Health, 88.5% of them reported that the system improved their access to treatment while another 60% reported improvement in children’s health after receiving these telepsychiatry services (UTMB Health 5).

In another study by Finger Lakes Community Health in Geneva, NY, implementation of telehealth also showed highly positive results (CHWS 26). Patients at this rural facility are mostly comprised of local farmworkers, majority of whom are undocumented, have limited transportation options and face significant geographic barriers in obtaining treatment. Thus, the facility implemented teledentistry and telehealth services, which showed an overall decrease in patient wait time, increase in the number of patients who received and completed their treatment and a decrease in no-show appointments (CHWS 26). In these two instances alone, the effects of telemedicine in revolutionizing the quality and extent of care patients receive is apparent. Telemedicine has ultimately made medical services more accessible by removing barriers that would otherwise hinder the quality of medical treatment patients receive and thereby greatly improving patient outcomes as a result.

The integration of the Telemedicine system has also been shown to be more cost-effective. In the previously mentioned study on children's telepsychiatry services conducted by the University of Texas Medical Branch, participants reported over a 50% decrease in emergency room visits for children's psychiatric needs a year after utilizing the service compared to a year before (UTMB Health 5). This statistic points to evidence that when patients receive adequate and quality care from the very beginning, they are less likely to require subsequent treatment. Telehealth services allow patients to receive a high standard of care from the start of their treatment until the very end, thereby reducing the costs associated with hospital visits. Another study by the Catholic Health Care West Congestive Heart Active Management Program, which provides telehealth services for congestive heart failure patients, found that hospital readmission rates decreased up to 85% for patients involved in the program. The decrease in readmission rates was also found to correlate with lower overall hospital costs. Telemedicine services ultimately ensure that patients are consistently able to receive quality care with fewer visits, thus contributing to overall lowered costs with respect to both the patient and the healthcare facility (CHWS 27). Moreover, Telemedicine services have also shown to be more cost-effective because they eliminate the costs associated with transportation to healthcare facilities. Transportation costs are especially a concern in rural and underserved communities where geographic barriers require patients to travel great distances to reach the nearest hospital (Rhoads 67). This is especially an issue in underserved communities, where there is little to no access to fast transportation methods such as cars, and the primary transportation method is by foot. Thus, the integration of telehealth services eliminates such costs.

In addition to lowered costs, Telemedicine services also promote a more connected healthcare system. By providing services to different areas all over the world, healthcare providers are able to gain a better understanding of the health-related issues affecting various communities beyond their own. In a traditional hospital setting, medical providers are often limited in the types of medical scenarios they are exposed to due to interaction with a small and often homogenous local community. However, with the integration of telemedicine services, providers are exposed to a wide array of medical scenarios as well as patients with more diverse health issues. Increased exposure allows for providers to gain a better understanding of how and the extent to which various illnesses and epidemics are affecting different communities. An increased awareness of global health issues, in turn, promotes a more globally connected and secure healthcare system.

### *Disadvantages*

While the Telemedicine system offers a wide range of advantages, it can also be hindering to healthcare services in several ways. The largest disadvantage is the communication barrier it confers between the patient and medical provider. Because consultations are performed virtually, there appears to be an inevitable decrease in connectivity between the patient and healthcare provider compared to traditional in-person consultations. A decrease in connectivity leads to reduced overall patient satisfaction, and therefore decreases the chances of patients using the telehealth service in the future. A survey by RelyMD, a web application that offers virtual medical consultations, found that the majority of patients still preferred in-person visits over their online medical services (About Us | Relymd). Additionally, Telemedicine services may also provide a different type of communication barrier. Online communication is more prone to

misinterpretations and misdiagnosis compared to in-person communication. A patient's inability to accurately and cohesively describe their medical problem in turn may cause the medical provider to misinterpret the information provided by the patient and therefore lead to the possibility of an incorrect or incomplete diagnosis. In an in-person consultation, however, the medical provider carries the advantage of touch thereby enhancing their understanding of the patient's medical problem and ultimately leading to a more accurate diagnosis. Thus, the communication barrier is an important one to consider, as it not only affects patient satisfaction but also poses a great health risk for the patient and a liability risk for the medical provider.

In addition to creating a substantial communication barrier, Telemedicine services are also not able to provide the same extent of services that traditional hospitals can provide. For instance, patients utilizing telehealth services do not have the same access to advanced equipment and tools. A pregnant patient using telehealth does not have access to the same radiology equipment that she would at an in-person appointment within a healthcare facility. This lack of infrastructure and facilities have the potential to produce negative patient outcomes, especially in cases where technological equipment is at the core of the patient's treatment. Moreover, due to the lack of advanced equipment available in virtual appointments, emergency care services may not always be possible. Time-sensitive emergency situations in particular require modern surgical tools and cutting edge technology, which are not available virtually. Moreover, virtually connecting a patient with a healthcare provider in an emergency situation is not always reliable and therefore poses a great risk to the patient. Therefore, while telehealth services do provide increased accessibility to communities that otherwise have essentially no



access to medical services, they still fail to provide the same extent and quality of medical care that traditional hospitals provide.

Another notable disadvantage of the Telemedicine system is that it fails to serve communities that lack updated technologies. Patients who do not have access to wifi, the Internet and computer devices are left out from the benefits of the services. Computer devices in modern day are also associated with high costs, so it is also not always economically practical or possible for patients to invest in these devices for the sole purpose of medical consultations.

Unfortunately, underserved and impoverished communities are often those that are in dire need of telehealth services and benefit most from them, but are also usually those that lack access to the technologies required to utilize these services (World Health Organization 10). This substantial, often overlooked, technological barrier prevents patients from receiving quality medical care. It is another plausible reason why telemedicine systems have not been widely implemented on a global scale. Many areas around the world are not as technologically advanced as the United States, making the implementation of telehealth services much more difficult and thus limiting in many aspects.

### *Conclusions*

Evidently, the introduction of Telemedicine has both benefits and drawbacks. The system has increased accessibility to medical services, especially for those in rural and underserved communities, and serves to benefit both the patient and healthcare system as a whole. However, there are also a few disadvantages associated with the system, primarily with respect to communication and technological barriers. Although the benefits outweigh the risks, the introduction of modern Telemedicine ultimately provides perspective on the extent to which

technology has shaped the field of medicine over time. New technological inventions such as MRI scanners, heart monitors and artificial intelligence have completely transformed healthcare on a global scale, particularly with respect to the quality of care patients receive (Wachter 89). These advanced tools are quickly replacing outdated, manual and time-consuming approaches to medicine. Despite these innovations, however, there is one aspect of medicine that can truly never be replaced by any machine or robot: human connection. Exploration of the advantages and disadvantages of the Telemedicine system alone emphasize the value of patient-to-provider interaction. The sense of touch, nurture and empathy is difficult to be replaced by a gadget or machine, no matter how advanced. Patients requiring treatment are usually in their most vulnerable states, and desire love and empathy during this time: feelings that only humans can foster for one another. It is difficult to imagine a scenario in which doctors will no longer be holding our hands when telling us about a life-changing diagnosis, but will instead be replaced by the voice of a robot through a computer screen.

In today's digital era, it is easy to get caught up in the midst of technological innovations such as Telemedicine that are rapidly altering the global healthcare system, and will continue to for years to come. At a time like this, it is important to consider the implications of such transformations, which continually serve to remind us that no algorithm or machine can ever replace the value of human connection.

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