

# *Analyze the Effectiveness of Telemedicine in Providing Healthcare Services in the United States*

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**Abstract:** The United States (US) government spending on the healthcare system is one of the highest in the world. However, the US healthcare outcome compared to other OECD countries is below average. This is caused by the number of patients visiting healthcare services remain low compared to the OECD countries due to the following reasons: affordability, allocation of healthcare services, and accessibility. The lack of universal coverage in the US healthcare system poses a challenge of affordability to patients. This led to a high out-of-pocket spending on healthcare services and patients will choose to skip or delay the treatment. Allocation of healthcare services such as the lack of patients and the hospital beds caused a high waiting time and caused patients unwillingly to access to healthcare services. The long-distance travel in the rural area led to low accessibility to healthcare services. Telemedicine is a method that allows the delivery of healthcare services remotely using technology that can solve the US healthcare problems. The adoption of telemedicine in the US healthcare system has experienced a substantial increase during the period of Covid. The analysis on the effectiveness of using telemedicine to provide healthcare services in the US healthcare system will be conducted based on factors related to the existing challenges.

**Keywords:** Telemedicine, healthcare system, accessibility, affordability, efficiency.

## 1. Introduction

The US healthcare system is highly intricate as it is continuously evolving and has a complex interconnecting relationship among healthcare professionals and patients. In the US healthcare system, there are many healthcare professionals that provide services to cater different patients' needs. Moreover, it has both non-profit and profit hospitals which are 57% and 25% in 2018 respectively [1]. There are different healthcare services including primary care, outpatient specialist care, after-hour care, and mental health care that are targeted to different patient groups. To ensure the quality of care, the US Department of Healthcare Human Services have established quality standard and information transparency on the healthcare process, outcomes, and patients' experiences. This ensures the effectiveness of healthcare delivery and improves outcomes for the diverse population it serves.

The US healthcare system involves various payers as it does not provide universal converge and it is financed with Medicare and Medicaid. Medicare ensures patients aged 65 and older have the universal right to health care [1]. Medicaid ensures that low-income families and individuals with a disability have access to healthcare services by receiving federal funding [1]. In 2019, 50% of citizens

received private insurance coverage through their employer, 6% received private insurance through healthcare insurance marketplaces, 20% of citizens relied on Medicaid, 14% on Medicare, and 1% on other forms of insurance, leaving 9% of Americans uninsured [1]. Many federal agencies are tasked to monitor and reduce disparity by developing policies and programs. For example, federal law requires the most hospital to treat patients who require emergency care regardless of their ability to pay, insurance status, national origin, or race. The US healthcare system is continuously reflecting and reforming to pursue healthcare equity, improve efficiency, and overall quality of healthcare services.

## **2. Problem of the US healthcare system**

### **2.1. High Spending and Outcomes Worsen**

A major problem with the US healthcare system is a worsening health outcome even though with an increase in healthcare spending. In 2021, US spending on healthcare is twice as much as the average OECD countries, which is 17.8% of gross domestic product [2]. Despite the heavy investment, the American experience worsened health outcome as the health expectancy in the US in 2020 was 77 years which is three years lower than the OECD average and it has worsened over time. Further, there is a wide racial and ethnic health disparity between non-Hispanic American Indians or Alaska Natives and non-Hispanic Whites. The life expectancy for non-Hispanic American Indians or Alaska Natives is 71.8 years and non- non-Hispanic whites are 78.8 years [2]. Moreover, in the Covid-19 pandemic, the US had the highest death rate which were more than 3,00 deaths compared to other high-income country [2].

The lowest frequency of visiting physicians in America has contributed to poor health outcome. The overall physician visit in the US is four visits per person a year which are less frequent compared to other high-income countries and the OECD average [2]. This is caused by the lack of doctors in the US which the physical consultation per capita is 4 compared to the OECD average of 5.7 [2]. Moreover, the average length of hospital stay in the US is only 4.8 days compared to 7.3 OECD average [2]. The less frequent physician visits may be caused by the low supply of physicians and the lack of number of hospital beds in the US. Statistics show that the number of hospital beds in the US is only 2.8 hospital beds per 1,000 population compared to the OECD average of 4.3 [2]. Even though US spending on the healthcare system is the highest compared to other countries, the health outcome is worse caused of the lack of physician visit. The primary reason for preventing Americans from accessing healthcare services is affordability as the out-of-pocket expense made half of the patients skip or delay in getting care [2]. Moreover, US policymakers could learn from other OECD countries to design a more effective approach to reducing healthcare spending while improving the overall health outcome and improving the allocation of healthcare resources.

### **2.2. Integration of Telemedicine in the US**

The usage of telemedicine has increased significantly in the United States during the period of COVID-19. Telemedicine refers to patients and healthcare providers can conduct consultation and treatment remotely using technology. Before the period of Covid telemedicine in the US is expected to have a steady and low growth rate. Patients who had access to telemedicine before the period of COVID-19 had a positive impression of using telemedicine due to ease of use, low cost, improved communication, and save time. In March 2022, Congress made a significant change to Medicare which loosened the restrictions on the origin of telemedicine services, eligible reimbursements, and the platform being used [3]. These modifications led to improvement in telemedicine reimbursement which encouraged access to healthcare services using telemedicine. After the Covid, more healthcare providers prefer to use telehealth to treat patients with chronic diseases. A study by Reed and

colleagues showed that there is no difference between patients who use telemedicine and in-person visits for the treatment of chronic illness. Telemedicine is an alternative for initial in-person care as if the patients meet all the low-risk criteria there is no need to visit in person. Further, patients who meet the low-risk criteria have a low rate of in-office follow-up treatment and less than 1% of using emergency services [3]. This demonstrate telemedicine is cost-effective and allows for a more efficient allocation of healthcare resources.

### **3. Evaluate the Effectiveness of Telemedicine in US Healthcare System**

The problem of the US healthcare system includes problems such as affordability, lack of healthcare resources, and accessibility. Telemedicine could be a solution to solve these problems and the evaluation of effectiveness will be conducted based on these factors: affordability, accessibility, and allocation of healthcare resources.

#### **3.1. Affordability**

Implementing telemedicine to provide healthcare services can reduce healthcare costs for people who live in rural areas of the United States. Travel cost is a significant factor contributing to healthcare costs as long-distance travel requires access to healthcare services in certain geographical areas. According to the Pew Research Centre, patients who live the rural area in America requires 10.5 miles of distance travel to reach the nearest hospital compared to 4.4 miles distance for patients in urban area. Based on the traffic in the United States, it takes 17 minutes for patients living in rural areas and 10 minutes for patients living in urban areas [4]. A more specific example of a Native American community in Alaska demonstrates that a considerable distance travel is required to reach the nearest medical facilities which is like the distance travel between Chicago and New York. This leads to significant travel costs of \$100 to \$1200 travel to seek healthcare services [5]. The reduction in the travel cost will make healthcare services more affordable thus encouraging more patients to access the healthcare services.

Telemedicine to provide healthcare services eliminate the need to travel and increase the accessibility of healthcare services for the population living in the rural area of the United States, thereby reducing healthcare cost. Further, this will save more time for patients and allow more immediate access to healthcare services. Opportunity costs incurred if patients are away from work for medical appointments will lead to a loss of wages [5]. The use of telemedicine allows videoconferencing with healthcare professionals avoiding opportunity cost and leading to more efficient healthcare services. Telemedicine allows patients to message or email healthcare specialists when they have non-serious healthcare problems or simple follow-up treatment. This will save both patient's and healthcare providers' time unless the patients have serious healthcare concerns or problems. The insufficient availability of physicians in a problem in the US healthcare system, and the implementation of telemedicine can improve efficiency. As a result, more patients can have access to healthcare services.

#### **3.2. Accessibility**

Transportation barriers can lead to problems in accessing healthcare services and eventually lead to missed or delayed consultations. Based on the study, patients in low-income families or with disability are more likely to experience difficulties in accessing transportation which lead to greater health problems. Study shows that 1 in 3 respondents are unable to access healthcare services due to no household [6]. Moreover, physical shortage in rural areas is another problem because there is difficulty in recruiting and retaining physicians at rural hospitals. The current ratio of primary physicians in rural areas is 39.8 per 1000 population compared with 53.53 per 1000 population [7].

Telemedicine can address this problem as patients can stay at home or at a place where they feel most comfortable receiving medical services. This can lead to increased demand for accessing healthcare services using telemedicine demonstrated by Figure 1.

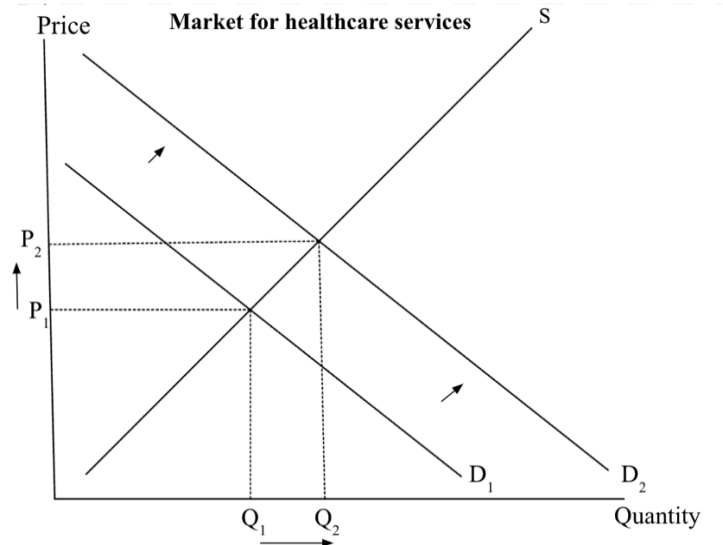


Figure 1: Increase demand for healthcare services(Picture credit : Original)

The initial equilibrium is when S<sub>1</sub> intersects with D<sub>1</sub> where price is at P<sub>e</sub> and quantity is at Q<sub>e</sub>. Telemedicine solves the transportation problem allowing low-income families and disabled people to have more efficient access to medical services. As a result, this led to an increase in patient demand from D<sub>1</sub> to D<sub>2</sub>. The price increases from P<sub>1</sub> to P<sub>2</sub> and the quantity demanded increases from Q<sub>1</sub> to Q<sub>2</sub>.

However, telemedicine may not be accessible to all populations as in rural areas and some low-income families will experience technology barriers. Internet use has increased significantly; however, the rural and urban digital gap remains a problem. There is 69% of rural residents using the internet compared to 75% of urban residents [8]. Moreover, in household incomes below \$30,00 a year, 24% do not own a smartphone and 27% of adults are smartphone-only internet users which means they do not have internet at home [9]. This digital gap between the different income groups and geographical regions in the United States may lead to healthcare disparity in accessing telemedicine healthcare services.

### 3.3. Allocation of Healthcare Resources

#### 3.3.1.Reduce Wait Time

The waiting time to visit a general practitioner and specialist consultation in the United States is the second highest compared to other OECD countries. For example, statistics show that there are 28% of patients in the United States mentioned that they rarely and never get an answer from their regular doctor's office on the same day [10]. The factors that contribute to the long waiting time in the US are the healthcare providers' concentration in urban areas compared to rural areas and the insurance status. "The wait time in the mid-size metropolitan areas such as Hartford and Connecticut have 32.8% longer wait times than the larger metropolitan area such as Washington, D.C." [11]. Patients who live in the less urban area will experience a longer wait time Moreover, private health insurance patients have shorter waiting times than publicly insured patients. Private insured patients are likely to receive

primary care physician appointments within a week and have a lower probability of facing a wait time exceeding 30 days [11].

Figure 2 shows telemedicine can increase efficiency as more healthcare services can be delivered virtually thereby reducing the healthcare waiting time.

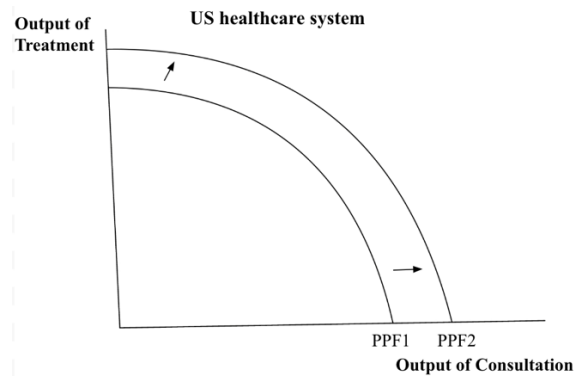


Figure 2: Production possibility frontier (Picture credit: Original)

Incorporating technology in the healthcare sector shifts the production possibility curve rightward from PPF1 to PPF2. Telemedicine is much more efficient than in-person consultation as the study found that video consultation is around 12 minutes which is 20% less than in-person treatment [12]. Further, telemedicine allows healthcare professionals to have access to patients' information more conveniently and efficiently. This will improve the overall efficiency of the consultation process thus reducing waiting time.

### 3.3.2. Improve Coordination

Moreover, healthcare services can be more efficiently delivered and allocated as telemedicine allows patients to see healthcare professionals schedule, make and reschedule appointments accordingly. Figure 3 demonstrates telemedicine can increase the number of healthcare services provided.

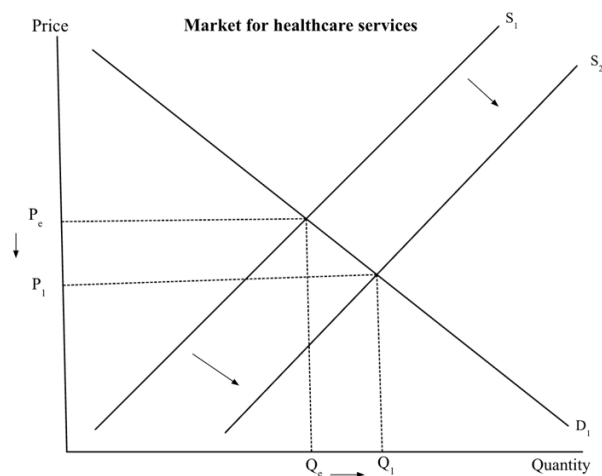


Figure 3: Increase in delivery of healthcare services(Picture credit : Original)

Integrating telemedicine has great potential in enhancing the efficiency of healthcare professionals. Simplifying basic tasks can reduce healthcare professionals' workloads and increase job satisfaction. Telemedicine ensures the appointment can run smoothly, avoid cancellation, and maximize the

amount of healthcare services [13]. As a result, the supply curve of healthcare services shifts rightwards from S1 to S2 and the quantity of supplied healthcare services can increase from Qe to Q1.

### 3.3.3. Efficient Provision of Healthcare Services

In the United States, the healthcare expenditure is twice as much as the average OECD countries. The healthcare expenditure grew by 50% and 17.9% of the GDP was spent on healthcare. Telemedicine could potentially reduce healthcare spending such as by reducing emergency department visits. A study shows telemedicine allows synchronous communication with patients through video conferencing. Emergency physicians can have access to previous patient's health records using the health information exchange system. The physicians can use this information and connect with patients to diagnose symptoms and design treatment options. After the examination or certain situations, patients do not have to be directed to the emergency department instead they can go to primary care. Further, patients are provided with guidance regardless of traveling to the emergency department by taxi or personal travel. Statistics show that patient transport to the emergency department has decreased significantly by over 50% and the team was able to be back in service 44 minutes faster [14]. This has the potential to reduce US government spending by reducing spending on unnecessary emergency hospital visits. More healthcare spending can be spent on increasing the supply of healthcare resources such as healthcare providers and hospital beds.

### 3.3.4. Provision of Healthcare Services

The healthcare services provided by telemedicine will be evaluated based on the types and the quality of healthcare services. Restriction and limited types of services can be provided using telemedicine. According to the US telemedicine platform, QuickMD stated that some healthcare treatments cannot be provided online. For example, a condition that causes severe pain requires in-person consultation to carry out a more detailed examination such as an X-ray or an ultrasound [15]. Prescription of controlled medication and medication that requires injection involved in-person visit and medical evaluation [15]. In-person treatment allows healthcare providers to conduct medical evaluations to provide medication accordingly. Also, patients with mental health illnesses can use telemedicine. However, in severe cases such as experiencing depression and feeling suicidal it requires in-person treatment [15]. In addition, highly specialized care or highly complex treatment involved requires in-person treatment. There are restrictions and limited types of healthcare services can be provided online.

Using telemedicine healthcare professionals can do a more rigorous review of patient's health using online patient health records. This can increase access to high-quality healthcare facilities as patients can have access to more customized clinical services and compare healthcare professionals using telemedicine [14]. Telemedicine enables patients to meet the best healthcare providers even though the healthcare professionals are in another country. Moreover, telemedicine includes features that allow patients to rate and compare healthcare professionals [13]. The rating, feedback, and comments allow patients to make more informed and rational decisions, thus allowing high-quality treatment and maximizing patient benefit.

Moreover, the quality of healthcare services has improved using telemedicine as it allows early intervention and more efficient treatment of illness. Telemedicine has not only created beneficiaries for those with chronic illness but allows early intervention for patients with heart disease or stroke. As a result, early intervention can reduce morbidity and mortality. The improvement in telehealth coverage led to immediate access to healthcare services, improved quality of healthcare services and a more desirable health outcome.



## 4. Conclusion

In conclusion, the problems with the US healthcare system have high government spending but health outcomes worsen due to the low frequency of accessing to healthcare services. The lack of access to healthcare services by patients is caused by factors such as affordability, accessibility, and allocation of healthcare services. After the period of Covid, telemedicine became a popular way of accessing healthcare services using technology. To some extent, telemedicine can provide efficient and effective healthcare services in the US healthcare system. Using telemedicine can lead to a lower cost, improve accessibility and quality of healthcare services, and allow efficient allocation of resources. However, telemedicine led to rising healthcare disparity and limited healthcare treatment can be provided.

Telemedicine improves the US healthcare system's affordability as online treatment avoid transportation cost and opportunity cost. For patients who live in rural areas, the transportation cost can be reduced significantly making healthcare services more affordable. Also, there will be no opportunity cost as the consultation with doctors will be 20 minutes which eliminates the time spent on transportation. Therefore, patients do not have to spend a large amount of time on visiting healthcare services, and they can choose a time when they are most convenient. This not only reduces cost but also encourage access to healthcare services. Moreover, there is a physician shortage in rural area and the transportation barriers lead to a low accessibility to healthcare services for disabled and rural families. Telemedicine can solve the gap as patients who live in rural area can access more healthcare resources online. Telemedicine allows more efficient allocation of healthcare services and a reduction in waiting time due to the improved coordination between healthcare providers and patients to avoid schedule conflicts. Further, telemedicine reduces emergency department visits which maximizes the use of healthcare resources.

However, telemedicine can increase healthcare disparity for patients who do have access to technology as there is a large disparity in access to technology between geographical areas (rural vs urban) and different income groups. Certain groups of people are still being excluded and not being able to access healthcare services. Moreover, limited provision of healthcare services can be provided due to regulation and more accurate diagnosis can take place to ensure patient's health and safety. Here are the examples of situations where the in-person visit is required when patients experience severe pain, medication evaluation, highly specialized care, and treatment.

## References

- [1] Ispor.Org. "US Healthcare System Overview-Documentation Requirements." Ispor.Org,
- [2] Commonwealth Fund. (2023) *US health care from global perspective, 2022: Accelerating spending, worsening outcomes.*
- [3] Shaver J. (2022) *The State of Telehealth Before and After the COVID-19 Pandemic. Prim Care. Dec;49(4), 517-530.*
- [4] Lam, O., Broderick, B., Toor, S. (2018) *How far Americans live from the closest hospital differs by community type. Pew Research Center.*
- [5] Kruse, C.S., et al. (2016) "Telemedicine Use in Rural Native American Communities in the Era of the ACA: A Systematic Literature Review - Journal of Medical Systems." SpringerLink, Springer US.
- [6] Cochran, A.L., McDonald, N.C., Prunkl, L. et al. (2022) *Transportation barriers to care among frequent health care users during the COVID pandemic. BMC Public Health 22, 1783.*
- [7] Kichloo, A. Albosta, M. Dettloff K, W.F, El-Amir, Z. Singh, J. Aljadah, M. (2020) *Telemedicine, the current COVID-19 pandemic and the future: a narrative review and perspectives moving forward in the USA. Fam Med Community Health. 8(3), e000530.*
- [8] Carlson, E., Goss, J. (2016) *The state of the urban/rural digital divide. Washington: US Department of Agriculture, National Telecommunications and Information Administration.*
- [9] Vogels, E. A. (2021) *Digital divide persists even as Americans with lower incomes make gains in tech adoption.*
- [10] OECD. (2020) *Waiting times for health services: Next in line. OECD Health Policy Studies.*

- [11] Waldrop, T. (2019) *The Truth on Wait Times in Universal Coverage Systems*. Center for American Progress.
- [12] Global Data Systems. "3 Ways Telemedicine Makes Healthcare More Effective and Efficient." *Global Data Systems*,
- [13] Haleem, A. Javaid, M. Singh, R.P. Suman, R. (2021) *Telemedicine for healthcare: Capabilities, features, barriers, and applications*. 2:100117.
- [14] Snoswell, C.L., Taylor, M.L., Comans TA, Smith AC, Gray LC, Caffery LJ. (2020) *Determining if Telehealth Can Reduce Health System Costs: Scoping Review*. *J Med Internet Res*.
- [15] Quick, M.D. (2021) "Telemedicine: What Cannot Be Treated Online?" *QuickMD, quick*.