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Understanding Public Perception of Telemedicine

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UNDERSTANDING PUBLIC PERCEPTION OF TELEMEDICINE

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ABSTRACT

The healthcare system in the United States is struggling to meet the needs of a growing patient population amidst the burden of provider shortages and rising costs, where no simple or easy answer exists. However, telemedicine has emerged as a possible solution with well documented benefits such as increasing provider coverage and saving costs. Despite the proven benefits, many people do not use telemedicine and there is little data to answer why it is underutilized. Therefore, this study sought to understand the public's perception of telemedicine service. It was hypothesized that gender, age, number of children in the household, education level, and area of residence are variables that could impact telemedicine use.

In this study a survey was designed and distributed to participants at the Richfield Wellness Expo, located in Richfield, MN. The survey asked participants questions about demographics, telemedicine usage frequency, and reasons why the participant chooses to use or not use telemedicine. Chi square analysis was utilized to determine if relationships existed between demographics and telemedicine usage as reasoning for using or not using telemedicine. Results indicated that the only variable impacting a person's telemedicine usage was geographic location; participants living in a rural area were significantly more likely to use telemedicine ($P=0.03$). The most common reasons for not using telemedicine were that participants did not know how to access it, were unsure if their insurance covered it, or preferred to be seen in person for their healthcare. Due to the demographic, geographic and time constraint limitations on this study, further research should be done to further understand telemedicine usage. However, study results suggest that focused public information campaigns may be needed to increase awareness, understanding, and access to telemedicine.

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Introduction

In a world where a remote starts the car, friends living on opposite sides of the world see each other every day, and a simple swipe of a piece of plastic can buy a new wardrobe, it is not a stretch to say that technology is everywhere. Technology has revolutionized every aspect of the way human beings live, spend their money and maintain relationships, and medicine is not exempt. The use of technology in medicine over the last century has radically transformed how providers care for patients. One of the most revolutionary changes is the use of telemedicine, where patients can be seen by a provider and receive a diagnosis and treatment plan all while sitting on the living room couch. While significant convenience and cost savings are associated with telemedicine visits, a lack of data is available on patient usage and only 15% of family practice physicians reported using telemedicine (Moore, Coffman, Jetty, Petterson, & Bazemore, 2016). This study sought to understand some of the barriers to more people utilizing telemedicine. Chapter One will address the history of telemedicine development as well as address the purpose, limitations, and significance of this study.

Background

Telemedicine is the use of technology to provide patient care and can take the form of video conferencing, the internet, store-and-forward imaging, streaming media, and terrestrial and wireless communications (Darkins & Cary, 2000). The sophisticated methods used to execute telemedicine are the result of decades of technological advances beginning with the invention of the telephone in 1876 and continuing today with the development of equipment such as digital stethoscopes and otoscopes (Hochfelder, n.d.). Telemedicine was initially used for a limited number of populations that were logistically too remote to utilize traditional medicine: arctic

explorers, oil-rig workers, overseas military personnel and even astronauts (Darkins & Cary, 2000). The experience gained by developing telemedicine in very remote populations naturally evolved to applying telemedicine to rural populations, prison healthcare systems, and other areas where access to medical care was limited (Darkins & Cary, 2000). Telemedicine programs became increasingly cost-effective as the capital expenditures to set up remote technologies became more affordable, and today over 200 networks and 3,500 locations deliver telemedicine in the United States (American Telemedicine Association [ATA], n.d.-a; Doolittle, O'Neal Spaulding, & Williams, 2011).

Telemedicine has been shown to have many benefits, especially in a healthcare system with high costs and provider shortages in certain areas. One benefit of telemedicine is that it increases access to care in medically underserved areas such as rural and urban areas as well as developing countries (Young & Ireson, 2003; McConnochie et al., 2005; Ambroise et al., 2018). Telemedicine has also positively influenced patient outcomes by allowing patients to have an increased amount of contact with healthcare providers as they can access support networks from their homes. This can be seen in patients receiving treatment for PTSD and obesity outpatient programs (Fortney et al., 2015; Goulis et al., 2004; Qiang & Marras, 2015). Furthermore, the removal of social stigma barriers by not requiring patients to seek treatment at a physical facility is another benefit telemedicine boasts (Marano et al., 2018).

Additional benefits of telemedicine include savings in both cost and environmental aspects. Telemedicine has been shown to prevent costly hospitalizations in skilled nursing facilities, decrease the cost of rural pediatric psychiatric care, and decrease the cost of diabetic ophthalmic care in rural Appalachia (Chess, Whitman, Croll, & Stefanacci, 2018; Spaulding, Belz, DeLurgio, & Williams 2010; Richardson, Fry, & Krasnow, 2013). Finally in addition to

the fiscal benefits, the use of telemedicine has also saved thousands of driving miles, preventing many tons of CO_2 and other pollutants from being released into the atmosphere (Dullet et al., 2017).

Despite the numerous benefits to the use of telemedicine, there are also barriers that need to be considered. One example the lack of provider education (Nelson, 2017). Many providers assessing and diagnosing patients through a telemedicine platform have received little to no formal education on how best to communicate and diagnose remotely (Nelson, 2017). In addition to lack of education, patient compliance with follow-up recommendations given via telemedicine tends to be worse, further hindering the potential effectiveness of telemedicine (Purc-Stephenson & Thrasher, 2011).

Another barrier to telemedicine is the high initiation cost and lack of infrastructure. Telemedicine programs can cost as much as $184,819 to implement and thousands more to maintain this technology, a financial burden many rural hospitals most in need of telemedicine are unable to bear (McSweeney, Pritt, Swearingen, Kimble, & Coustasse, 2017). Finally, patients may simply be reluctant to use telemedicine. For example, a greater reluctance to use telemedicine in one study was seen among elderly populations as well as those whose highest level of education was a high school diploma (Sorensen, 2008). However, the barriers to individual telemedicine usage have not been well-studied and warrant more research.

While individual usage is an important factor in telemedicine utilization, legislation and regulation also significantly influence scope of telemedicine practice and implementation within the United States. Beginning in the 1990's, when telemedicine began being implemented to increasing number of populations, state and federal government bodies considered telemedicine

to be substantially different from traditional face-to-face care, and began developing regulations to control its use (Hafner-Fogarty, 2016). Substantial uncertainty existed regarding inter-state use of telemedicine and by 2003 thirty-one states had prohibited out-of-state providers from practicing without a state medical license (Hafner-Fogarty, 2016; Waller & Stotler, 2018).

Legislative activity gained substantial momentum in the early 2000's and according to the American Telemedicine Association, all 50 American states currently have regulations covering telemedicine (Thomas & Capistrant, 2017). Efforts are being made to expand access to telemedicine via insurance coverage regulations and to develop interstate practice and licensure agreements. State governments also create legislation to regulate the relative reimbursement rates for telemedicine versus in-person care (Yang, 2016). Due to the substantial legislative power of individual States there are significant differences in telemedicine access and utilization across the United States (Yang, 2016).

In addition to legislative developments in telemedicine, issues of legal and ethical consideration have significant influence on telemedicine practice. Topics such as patient privacy, insurance coverage, and medical malpractice liability become complicated in the absence of clearly defined geographic jurisdictions (Barnes, 2006). Ensuring that quality care can be provided at a distance is tantamount to success of telemedicine, and programs must take special efforts to protect the patient-provider relationship (Chaet, Clearfield, Sabin, & Skimming, 2017). To this effect, providers must also be able to gauge the capability of their patients to follow telemedicine treatment plans such as operating home monitoring equipment (Chaet et al., 2017). When such capability does not exist with the patient or their familial/communal support systems, telemedicine may not be the ethically appropriate choice, as too much could be compromised in the quality of outcome.

Problem Statement

In the United States, life expectancies are increasing, populations are getting older, and people are living with more chronic disease, thus increasing the need for more healthcare. However, traditional medicine works in a one to one provider to patient relationship, and with an increasing number of patients, not enough providers are available to meet the increased demand (Rivas & Wac, 2018). In addition, 20% of the Gross Domestic Product (GDP) is currently spent on healthcare, equaling more than $3 trillion per year (Rivas & Wac, 2018).

Considering both financial cost and provider shortage, the only practical option is to use providers more efficiently and effectively (Rivas & Wac, 2018). One way to accomplish this is telemedicine. Despite the 150 year history backing the use of telemedicine, considerable cost savings, and easy patient access, telemedicine has yet to become commonplace among healthcare for most people (Chess et al., 2018). A lack of data exists describing the number of people using telemedicine, why certain patients or family members who do not use telemedicine choose not to use it, and what barriers might be impacting telemedicine usage. Understanding the barriers or concerns that patients have about telemedicine can help healthcare providers understand how to educate patients on the potential benefits of telemedicine and increase utilization of the services. Thus, having a lack of research on the specific barriers to the usage of telemedicine by patient populations will hinder the growth of telemedicine.

Purpose of the Study

The purpose of this study is to assess the public's current perception of telemedicine and willingness to use telemedicine to receive healthcare. For participants that use telemedicine, the study will assess what it is that they like about using telemedicine, and for those who do not use telemedicine, the study will assess what barriers prevent participants from using telemedicine. In

gathering this data, some areas of improvement will be identified that providers and healthcare facilities utilizing telemedicine will need to address for telemedicine to reach its potential and begin to solve some of the many problems plaguing the American healthcare system today.

Significance of the Problem

Examination of the United States healthcare system reveals there many problems that need to be fixed. By 2025 the cost of healthcare will have increased to 20 percent of the US economy, approximately 28 million people are uninsured, and many do not have access to quality healthcare based on where they live (Jordon, 2018). Increasing the number of people using telemedicine services is one of the proposed solutions to some of these problems. Yet, this cannot be achieved unless public perception of telemedicine improves and becomes more accepting of telemedicine.

Therefore, a study designed to elucidate the reasons why people are not currently utilizing telemedicine will be significant to the advancement of the telemedicine industry. Healthcare systems can use the information to address specific patient concerns, update their methods of delivering telemedicine care, or even create new marketing strategies. Telemedicine has incredible potential to alleviate the healthcare crisis many are facing in the United States today, and by working to overcome barriers to usage telemedicine has the potential to radically transform the future of healthcare.

Research Question

After an analysis of where telemedicine is currently being used, it remains clear that although it has many potential benefits, telemedicine is not being used to its full potential. Therefore, this study will address the following research question:

What barriers exist that prevent patient acceptance and utilization of telemedicine?

Definition of Terms

The study being conducted will be using a number of terms and as such it is important to define the terms being used throughout the research project:

- Provider: Any certified healthcare professional providing care to patient populations to include Registered Nurses, Physician Assistants, Physicians, Certified Nursing Assistants and Medical Technology Technicians.
- Rural: All areas not a part of an urban or suburban area (United States Census Bureau, 2015).
- Suburban: An area with a population of 2,500-50,000 and part of an urban area (United States Census Bureau, 2015)
- Urban: An area with a population over 50,000 (United States Census Bureau, 2015).
- Telemedicine: The use of technology to provide patient healthcare remotely. Technologies used include video conferencing, the internet, store-and-forward imaging, streaming media, and terrestrial and wireless communications (Darkins & Cary, 2000).

Conclusion

In the context of rapidly expanding technology as well as an increasing shortage of providers, telemedicine is positioned to be a potential major solution in the coming years. Yet, despite strong evidence supporting the benefits and cost savings, many people do not utilize telemedicine (Doolittle et al., 2011). This study sought to understand why the disconnect exists between the benefits of telemedicine and usage by identifying areas where telemedicine could be improved upon in order to increase usage. In the next chapter, a literature review was performed to provide more information about the benefits and barriers of telemedicine as well as current legislative, legal, and ethical considerations to telemedicine.

Chapter 2: Literature Review

Introduction

Healthcare is facing many challenges today including disparities in access to healthcare, rising costs of healthcare, and an increasingly stressed healthcare workforce. Many ideas exist for how to overcome these challenges, and one of the frontrunners is telemedicine. Telemedicine has been widely studied and found to provide many benefits and improvements in addressing problem areas of healthcare. However, a few areas of weakness exist in telemedicine that have either not been studied well or need to be addressed before telemedicine can to be successfully scaled up nation-wide. Understand these weaknesses and exploring opportunities for future development is facilitated by a review of various legislative, legal, and ethical considerations in telemedicine practice.

History of Telemedicine

The concept of using tools and systems to communicate medical information is centuries old, but the practice of delivering healthcare at a distance instead of in the traditional face-to-face model has only been utilized for the last 150 years (Darkins & Cary, 2000). The invention of the telephone in 1876 marked the technological advance that set the stage for the development of modern telemedicine (Hochfelder, n.d.). With this revolutionary technology, medical providers found they could transmit the sounds of illness and discuss relevant symptoms and histories. This led to the first officially documented telemedicine diagnosis, when a case of croup was identified over the phone in 1897 (Darkins & Cary, 2000).

For the first half of the twentieth century the focus of telemedicine remained on communication via telephone, radio, and telegraph (Brennan, Mawson, & Brownsell, 2009). The next major breakthroughs began in the late 1950s, when technology for videoconferencing was

conceived by Cecil Wittson of the Nebraska Psychiatric Institute (NPI) (Schleicher, 2015). Wittson collaborated with the Bell Telephone Company to create a system of closed-circuit televisions that would allow private transmissions (Schleicher, 2015). By the mid-1960s this work led to the first instance of video-based telemedicine consultation services and allowed a state-run mental health facility over 100 miles away from Omaha, NE to access the superior resources of the NPI (Darkins & Cary, 2000).

Momentum for telemedicine development was sustained going into the 1970s, but the industry was soon confronted with the realities of a non-existent infrastructure. Telemedicine was too new to be accepted as high-quality and was therefore considered too risky to be implemented beyond small-scale, focused populations (Darkins & Cary, 2000). The limited scope of application also had a limiting effect on the economics of telemedicine, as the equipment needed for remote communications was a significant capital burden (Darkins & Cary, 2000). Therefore, despite early promise, telemedicine was simply too expensive and too unknown of an entity for the healthcare system and society to be willing to integrate telemedicine into the mainstay of healthcare (Darkins & Cary, 2000).

While telemedicine advancement largely stagnated between the 1970s and 1990s there were several areas in which practical constraints forced its development for certain populations including oil exploration companies, Antarctic survey teams, National Aeronautics and Space Administration (NASA) space missions, and military combat-field healthcare (Darkins & Cary, 2000). The common thread amongst these programs and industries was that the workers were so remote and access to conventional healthcare was virtually impossible, so the workers were hugely dependent on telemedicine. While the use of telemedicine in these specialized areas assured that the concept did not disappear, the telemedicine programs were small in scope and

did not make progress in establishing large-volume telemedicine systems or equipment. Due to the small scale use of telemedicine, the capital costs remained high and created a barrier to entry for early adopters (Darkins & Cary, 2000).

Compounding the issue of high infrastructure start-up costs was the lack of evidence-based research demonstrating cost-savings over time in the implementation of telemedicine. Consequently, during the 1990s healthcare systems were reticent to change their care delivery models without studies to demonstrate savings (Darkins & Cary, 2000). Yet while the foundational models were not changed, the niche populations that could benefit from telemedicine were expanding. By the mid-1990s telemedicine started being developed for management of prison and rural healthcare (Darkins & Cary, 2000). Rural programs also expanded including development of telestroke, teleoncology, and telecardiology in areas such as Kansas, where telemedicine care could reach patients over 300 miles away from a healthcare center in Kansas City (Doolittle et al., 2011). Popularity of telemedicine began to grow substantially in subspecialties where patient contact was not required. Teleradiology was an example of this phenomenon, and in just one year between 1995 and 1996 the number of teleradiology cases doubled, going from 125,000 to 250,000 (Darkins & Cary, 2000).

With the positive advancement of telemedicine into additional populations, data soon became available to support the financial stability of telemedicine programs. The experience of early telemedicine adopters at the University of Kansas Medical Center demonstrated that years were required to drop the cost of their telemedicine program and make it self-sustaining (Doolittle et al., 2011). Every five years after implementation the costs of telemedicine visits dropped by 50%, and after 10 years, when the cost was 25% of the initial price, telemedicine had fallen below the cost of a traditional in-office visit (Doolittle et al., 2011). Importantly, the

estimations of cost savings associated with telemedicine accounted only for the costs incurred by the healthcare system; they did not account for the additional cost savings associated with patients not traveling long distances and missing work to attend traditional face-to-face appointments. The estimated cost savings also did not account for the reality that some patients would be unable to travel and therefore go untreated without telemedicine (Doolittle et al., 2011). As such, the benefits of telemedicine extend beyond the financial solubility to the healthcare provider and into the accessibility and convenience of care to the patients.

At the turn of the twenty-first century came a proliferation of technology and information in the form of the internet, personal computers, and hand-held devices. Americans welcomed the technology into their daily lives and became accustomed to having elements of their personal lives managed electronically. Healthcare providers and inventive entrepreneurs quickly started generating health-related mobile software applications, creating over 165,000 applications by 2015 (McCarthy, 2015). Nationwide over 200 telemedicine networks have been created with approximately 3,500 locations delivering telemedicine care (ATA, n.d.-a). A survey by the Healthcare Information and Management Systems Society (HIMSS) of over 200 healthcare providers found that 62% were leveraging mobile technology for telemedicine services (Health Management Technology, 2015).

The Federal Government has also been playing an integral part in encouraging the continued development and adoption of telemedicine. The U.S. Department of Health and Human Services has an Office for the Advancement of Telehealth (OAT) commissioned to promote the advancement and use of telemedicine, particularly in rural areas (Health Resources & Services Administration, n.d.). OAT coordinates programs that provide grants for creating telemedicine networks, gathering and analyzing data for evidence-based studies on telemedicine

practice, and increasing programs for rural populations, veterans, and patients struggling with substance abuse. As of 2011, there were over 300,000 telemedicine consultations used by the Veterans Health Administration (ATA, n.d.-a). OAT also establishes telemedicine Centers of Excellence at centers that have established large-scale programs that are financially sustainable and help fund efforts for state professional licensing boards to create interstate agreements on telemedicine practice (Health Resources & Services Administration, n.d.). The Centers of Excellence serve as models for best-practices in telemedicine, and can be utilized by private and public healthcare systems to continue the development of telemedicine programs.

Benefits of Telemedicine

The advancement and integration of key technologies facilitating distance communication has allowed telemedicine programs to bring numerous benefits to healthcare systems. These benefits include increasing access to care, achieving better patient outcomes through increased compliance and reduced social stigmas, and generating cost and environmental resource savings.

Increased access to care. Many in the world today are living in medically underserved areas - from developing countries to war zones to many rural and urban areas (Young & Ireson, 2003; Ambroise et al., 2018). Among these areas there may be either a shortage of specialty care physicians or simply of any doctors (Young & Ireson, 2003). Because of these shortages, patients are often forced to drive hundreds to miles to receive care or the distance may prevent them from receiving any care at all (Qiang & Marras, 2015). One of the benefits of telemedicine is that it has the potential to bring better healthcare into these underserved areas.

Rural areas. In rural areas, not only does distance provide a barrier to proper healthcare, but also poverty, unemployment, lack of adequate healthcare, and a provider shortage (Young &

Ireson, 2003). However, telemedicine remains a promising solution to these barriers. One study evaluated the potential for a telemedicine program in rural and urban schools. The researchers found that evaluating students via telemedicine saved an average of 3.4 hours of work time and between $101 and $224 per visit (Young & Ireson, 2003). In populations where poverty is prevalent, saving work time and money is a huge step towards encouraging more individuals to seek medical care before their health problems become severe.

Another study evaluated the impact of telemedicine on rural emergency department care and found that telemedicine decreased door-to-provider time and shortened the transfer time to another hospital (Mohr et al., 2018). A patient often needs to be transferred to another hospital in an emergency situation because they require more care than what a smaller hospital has to offer. Therefore, transfer time is especially important because the outcome of many medical emergencies is dependent on how quickly patients are treated. In rural environments where resources are limited, emergency care is not always as quick as it needs to be.

Finally, a study done in western, rural China found that among patients that had a teleconsultation, 78% had a major diagnosis change and subsequently 55% had a change in their treatment, and yet this program saved between $2.3 and $3.8 million (Wang et al., 2016). Introducing telemedicine in rural areas has the ability to improve quality, efficiency, and affordability of healthcare, which are three of the major healthcare challenges in rural communities.

Urban areas. Other areas that are often medically underserved are urban areas, due to a higher prevelance of poverty leading to an inability to afford healthcare coverage. Poverty-stricken families also depend on child care so that the parents can go to work, and missing a day of work due to illness is often not an option for the family financially.

One study by McConnochie et al. (2005) looked at telemedicine's effects on absence of child care due to illness (ADI). The researchers found that daycare centers with telemedicine had a 63% reduction in ADI and that telemedicine was the strongest predictor of ADI (McConnochie et al., 2005). Telemedicine has the potential to not only bring better healthcare to these urban children, but also to assist the families financially by helping parents avoid a missed day of work. In the same study by McConnochie et al. (2005), the telemedicine program was then extended to include adults, and this resulted in patients who were highly satisfied with their care as well as less missed work time and had less visits to the emergency department (Markwick, McConnochie, & Wood, 2015).

Telemedicine was also studied in urban schools with similar results. Urban parents saved time and money by avoiding the need for parents to take time off work to bring their children to the clinic (Young & Ireson, 2003). Telemedicine clearly has the potential to help break the cycle of poverty and poor healthcare that plagues many urban families.

Developing countries. Developing countries also lag behind in access to healthcare, and this can also be improved with telemedicine. Ambroise et al. (2018) looked at a group of maxillofacial surgeons from France who used telemedicine prior to and after a humanitarian mission trip to Mali. Telemedicine allowed the surgeons to review imaging prior to the trip as well as perform follow-up visits after the trip (Ambroise et al., 2018). Overall, the physicians were better prepared and were able to bring more effective and efficient care to the patients in Mali (Ambroise et al., 2018).

Telemedicine can also be used by providers on medical missions who need to consult a specialist. One provider reported that another provider who was on a medical mission trip to Cambodia requested help in diagnosing a case of Henoch-Schonlein purpura (Edworthy, 2001).

The provider in Cambodia was able to send digital pictures as well as the patient's record to the consulted provider and a proper diagnosis was made (Edworthy, 2001). The patient was then started on the proper treatment and improved over the next few weeks (Edworthy, 2001). This ability to use telemedicine to obtain a specialty consult clearly benefited the patient in Cambodia by achieving a speedy and accurate diagnosis.

Another area of provider shortage in developing countries is neurosurgery. In India only 450 million of the 1060 million people have access to neurosurgical care, and this care is provided by only 750 neurosurgeons and 110 neurosurgical trainees (Ganapathy, 2002). In response to this, India has started to implement telemedicine programs. One pilot program established a small, 40 bed hospital in the rural village of Aragonda in India that was staffed with a pediatrician, general physician, and general surgeon (Ganapathy, 2002). The hospital was also equipped with state-of-the-art video conferencing system such that the physicians could have consultations with specialists (Ganapathy, 2002). As of when the article was published, about 400 teleconsultations had been given and in each of these cases a neurosurgeon was able to guide the local physicians in treatment courses or potential operations (Ganapathy, 2002). Overall, telemedicine shows great promise for bridging the gap of physicians and specialty care physicians in developing countries.

Better patient outcomes through increased care compliance. Patient compliance is a critical factor in patient outcome, and several studies have found that telemedicine increases patient compliance which leads to better outcomes. For example, one study found that amongst patients enrolled in opiate agonist therapy (OAT), the patients who were being treated via telemedicine were more likely to stay enrolled in treatment than those who were not (Eibl et al., 2017). Another study found that telemedicine significantly reduced PTSD symptoms in veterans

(Fortney et al., 2015). Fortney et al. (2015) felt that these reduced PTSD symptoms were a direct result of patient involvement in their own therapy, since telemedicine patients were 18 times more likely to initiate a therapy session and 8 times more likely to complete at least the minimum number of therapy sessions in order to see effects (Fortney et al., 2015).

Another study showing better patient outcomes was completed with a group of patients enrolled in both a traditional outpatient obesity treatment program as well as a telemedicine home-reporting system (Goulis et al., 2004). In addition to their outpatient program, the patients were required to report blood pressure and body weight to a call center three times per week for six months (Goulis et al., 2004). Following this, each patient's body weight, BMI, blood pressure, fasting plasma glucose, triglycerides, HDL cholesterol, and total cholesterol were measured (Goulis et al., 2004). The study found that patients who were also enrolled in the telemedicine home-reporting program had a significant decrease in body weight, total cholesterol, and triglycerides compared to those who only participated in the outpatient program (Goulis et al., 2004). The telemedicine patients were more engaged in their care since they had to continue to think about it three times per week instead of just once per month at their outpatient treatment.

Another way patient care compliance can be improved if the patients are able to overcome travel difficulties to a clinic. Travel distance is especially a problem with people requiring specialty care, where sometimes the clinic they need to visit is hundreds of miles away (Qiang & Marras, 2015). One study found that telemedicine was a way to reduce travel time for Parkinson's patients by an average of 209 minutes and that a majority of patients were satisfied with the quality of the healthcare they received via telemedicine (Qiang & Marras, 2015). In this

manner, telemedicine provided patients with the specialty care they needed, while saving them from driving hundreds of miles.

Removal of barriers due to social stigmas. Patients who may be too embarrassed to seek treatment for fear of others in the community seeing them at a clinic may also benefit from certain types of telemedicine care. An article by Heather Boerner (2018) discussed how it can be difficult for many patients to come in to the clinic to receive testing for sexually transmitted infections (STIs), especially for homosexual men in the Southern United States where homosexuality is not well accepted. In fact, a report published on the CDC website noted that almost two thirds of new diagnoses of HIV were found among black men who have sex with men living in the Southern United States (Marano et al., 2018).

However, there are currently studies underway for mobile application programs that have the ability to send patients at home testing kits for HIV and perform pre-exposure prophylaxis (PrEP) assessments (Sullivan et al., 2017). One such study found that the application was rated to have above-average usability and that 10% of the men eligible to start PrEP did so with most citing the app as the reason they started the medication (Sullivan et al., 2017). Data has not yet been collected on the effectiveness of such applications, but the potential they have to increase treatment or prevent STI's is promising (Boerner, 2018).

Reduction in cost. One of the biggest benefits of telemedicine is that it reduces cost for patients and the medical system. An area in which this cost savings is especially evident is in preventing costly hospitalizations of patients in skilled nursing facilities (SNFs). Studies have shown that having a patient evaluated by a primary care provider (PCP) prior to a transfer from a SNF to a hospital reduces the number of hospitalizations (Chess et al., 2018). However, not every SNF has a PCP available on site, so a study was performed to see how a telemedicine

consult would affect patient hospitalizations (Chess et al., 2018). The study followed a SNF in Brooklyn, New York for one year, and found that 91 of the 313 patients evaluated avoided hospitalizations with savings of more than $1.55 million (Chess et al., 2018).

Another area where cost savings has been observed due to telemedicine is in child psychiatry. A study was done in rural Kansas that found that a telemedicine psychiatry consult saved the families an average of $137.63 per visit mainly due to travel costs (Spaulding et al., 2010). When multiplied across the 257 study consults in the study, this totaled a savings of $35,369 over 6 months (Spaulding et al., 2010). In an area such as rural Kansas, these savings can make healthcare much more affordable, thus making it likely that children will receive the care they need.

Yet another study focused on cost savings due to telemedicine in ophthalmic screening in a rural health clinic in West Virginia, where there is a lack of access to ophthalmologic care (Richardson et al., 2013). In the study, patients determined to be at-risk for diabetic retinopathy were screened with a fundus camera and this image was then sent to and interpreted by an ophthalmologist at a different site (Richardson et al., 2013). Based on the results patients were advised to follow up annually or immediately with an ophthalmologist (Richardson et al., 2013). Prior to this program, all patients were being advised to see an ophthalmologist. Taking into account travel costs, work missed, overhead costs, and billing the study determined that the use of telemedicine saved an average of $153.43 per patient visit (Richardson et al., 2013). This added up to a total savings of $71,189.28 over the seven year course of the study (Richardson et al., 2013). Overall, these studies show how telemedicine often results in large cost savings for patients, especially in poor and underserved areas where specialty care is lacking.

Environmental savings. Yet another benefit of telemedicine is that it is often more environmentally friendly than traditional medicine. Dullet et al. (2017) evaluated the environmental impact of telemedicine on a health system in California between 1996 and 2013. The researchers found that telemedicine consultations saved 5,345,602 driving miles which translated to savings of 1,969 metric tons of CO_2, 50 metric tons of CO, 3.7 metric tons of NOx, and 5.5 metric tons of volatile organic compounds (Dullet et al., 2017). Working towards national implementation of telemedicine has the potential to greatly benefit the environment.

Barriers to Telemedicine

Although there are numerous benefits and future uses for telemedicine, there are also substantial barriers to implementation and maintenance of a telemedicine program that will need to be addressed as healthcare continues to evolve. Areas of weakness that may hinder the progression of telemedicine as well as its utilization are education, cost/infrastructure, compliance, and usage reluctance.

Lack of education. As in many areas of healthcare, education/training is often an integral part of a successful outcome for both provider and patient. Telemedicine utilizes a variety of technologies to assess patients including video interface, digital stethoscopes, and digital ophthalmoscopes, which require extensive training on proper use and monitoring (Juarez et al., 2018; Young & Ireson, 2003). Unfortunately, in the area of telemedicine the availability of training is nearly non-existent (Nelson, 2017). Many healthcare professionals are hired into positions that require them to utilize telemedicine to deliver patient care; however, there is currently no standardized curriculum or training courses available to healthcare professionals that would prepare them for a virtual care platform (Nelson, 2017).

According to Won, Clark, Greenwald, Carter and Sharma (2017), one of the barriers to telemedicine is the lack of training for providers on how to clearly and effectively communicate with patients via telemedicine despite the advancements for delivering technology-based healthcare. One study surveyed 34 patients diagnosed with Parkinson's disease that were being assessed for motor impairment via telemedicine visits to determine patient satisfaction with the remote visits (Qiang & Marras, 2015). Most patients reported a cost savings of $200 as well as having to travel less and saving more time; yet despite these benefits, five patients discontinued using the telemedicine services citing a lack of trust with the technician using the equipment on behalf of the remote provider. The level of distrust by the patient was determined to be mainly due to a perceived lack of training and incompetence with the equipment by the technician or provider (Qiang & Marras, 2015).

Not only is the lack of education on how best to provide care via telemedicine lacking, but also some clinical diagnostic screenings are failing to adequately assess and aid in the diagnosis of some patients (Juarez et al., 2018). According to a study conducted by Juarez et. al (2018), a sample of 20 children ages 20 to 34 months were referred to a diagnostic clinic for evaluation of Autism Spectrum Disorder (ASD) and were evaluated using gold standard screenings conducted via telemedicine. The clinicians assessing the children remotely were able to accurately diagnose 78.9% of the children; however, the study suggested that children with more complex cases often required further evaluation and follow-up in a traditional clinic setting (Juarez et al., 2018). In addition, the study suggested that despite the small sample size evaluated, better screenings would need to be developed to more accurately assess patients

remotely as well as improved technician education to administer complex screenings at remote sites for the providers (Juarez et al., 2018).

Poor compliance with follow-up care. Telemedicine can be a very effective tool when used correctly, yet compliance with advice given can vary greatly and in some areas is severely lacking. In a meta-analysis by Purc-Stephenson and Thrasher (2011) consisting of 184 studies, patient compliance via telephone triage recommendations by telenurses was evaluated based on the type of advice given, the attitude of the patient towards the advice given as well as communication on how to follow advice. Of the studies reviewed, overall compliance to triage advice was 62%; however, this varied significantly when evaluating the type of care recommended (Purc-Stephenson & Thrasher, 2011). Patients were much more likely to participate in self-care advice (79% compliance) as well as recommendations to go to a physical emergency care facility (63% compliance) and less likely to follow up with a non-urgent clinic visit (44% compliance) (Purc-Stephenson & Thrasher, 2011).

This compliance discrepancy seen between self-care, emergency care, and non-urgent care triage advice may be due to a failure of the provider or telenurse to effectively communicate why the advice was given (Purc-Stephenson & Thrasher, 2011). Patients most commonly attributed their failure to comply with hearing a different disposition, which was possibly due to a failure to communicate by the provider or incorrect recall (Purc-Stephenson & Thrasher, 2011). The study also found that patients were less likely to comply if the disposition or advice by the triage nurse did not match what the patient expected to hear (Purc-Stephenson & Thrasher, 2011). Overall, patient compliance tends to vary based on advice given and communication

received, both of which may be improved by better education for providers on how best to serve patients remotely.

High initiation cost and lack of infrastructure. In addition to the lack of education for healthcare providers, there is significant cost associated with starting and maintaining a telemedicine program. For example, a systematic literature review researched some of the most common barriers associated with the use and implementation of telestroke (telemedicine used for stroke care) and found that the average startup cost to implementing this telestroke infrastructure averaged around $184,819 and the technology/platform is suggested only to last up to three years before needing replacement (McSweeney et al., 2017). In many rural healthcare facilities, those most in need of telemedicine services, this cost can present an insurmountable barrier in a facility already struggling to maintain its budget (Nelson, 2017).

In addition to the initial startup expenses, a monthly fee is also charged for maintenance of the telestroke platform which, depending on the company, can vary between $5,000 and $6,000 per month for one machine (McSweeney et al., 2017). Even if these rural hospitals have the financial backing to begin implementation, broadband access may not be readily available in these rural areas further delaying necessary care in underserved communities (Nelson, 2017).

Of note, there are grant opportunities becoming available that may assist in startup costs and implementation of telemedicine if a facility meets certain criteria (Great Plains Telehealth Resource & Assistance Center, 2018). These grants are often specifically for initial implementation or expansion of a telemedicine program and are not considered long-term support, but may substantially assist organizations in overcoming the financial barriers associated with telemedicine (Great Plains Telehealth Resource & Assistance Center, 2018).

Reluctant usage by patients. Finally, patients may simply be reluctant to utilize telemedicine despite improvements in provider training, reduction in startup and maintenance costs, and patient-provider communication via telemedicine. According to a study by Sorensen (2008), 1,000 Danish residents were polled through a questionnaire with two of the questions asking specifically about attitudes of patients towards video consultations with a specialist and sending x-rays out to be read at another facility. The study revealed that 58% of the survey population would be highly reluctant to participate in a video consultation and only 26% were reluctant to participate in care where x-rays were assessed by a provider at another facility (Sorensen, 2008). There was also a higher reluctance to participate in either option amongst the elderly and those not educated beyond a high school diploma (Sorensen, 2008). The study did not address what prompted the relatively high reluctance to participate in a telehealth visit as opposed to sharing data between professionals.

One potential reason that patients are reluctant to use telemedicine is concerns over privacy. Patients must trust that the provider and technology modality are maintaining the patient's privacy, and some of the reluctance to use telemedicine may rooted in distrust in the provider or technology's ability to do so (Van Velsen et. al, 2016). According to Hall and McGraw (2014), current FDA guidelines are targeted at ensuring the safety and privacy of data in terms of medical equipment being used. However, there is no federal regulation of privacy for how medical data is collected, used, or stored to ensure privacy and security for patients using telemedicine. Providers or healthcare systems may provide telemedicine care through third-party services that may have access to protected information. Additionally, modalities such as video conferencing with a provider do not necessarily ensure that there is not another unknown party

standing outside the scope of the camera or within listening distance that may have access to private health information (Hall & McGraw, 2014). The lack of specific federal legislation regarding telemedicine creates opportunities for security risks and may perpetuate an atmosphere of reluctance and distrust in the use of technology for remote healthcare.

The barriers to telemedicine certainly warrant more research as many of the studies discussed focused on small study populations and larger study populations would provide more reliable results and possibly insight as how best to approach patient care in an ever-evolving technological world.

Legislation

To better understand areas of opportunity for expansion and improvement it is helpful to review telemedicine legislation and regulation. Analysis of the bodies of law governing the practice, and how legislation on telemedicine has changed over time, can provide additional perspective and uncover areas where focused attention and effort may advance telemedicine utilization and efficiency.

As telemedicine began gaining momentum in clinical practice in the 1990's, state and federal government bodies grappled with questions over how telemedicine differed from face-to-face care and what legislation was needed to regulate the new form of healthcare delivery (Hafner-Fogarty, 2016). Legislative considerations for telemedicine were also influenced by the simultaneous development and integration of the Internet into daily lives and business practices. The rapid expansion of electronic technology promised to help telemedicine reach patients in need of care, but also threatened an unchecked proliferation in the virtual space of the Internet, where geographic boundaries no longer existed, state and legal lines became blurred, and the right to health information privacy must be maintained (Mehta, 2014).

In response to the conflicting sense of excitement and concern about telemedicine's role in healthcare, states began developing legislation and regulations to control its use. California led the way in 1996 by enacting rules prohibiting insurance companies from requiring face-to-face provider-patient appointments (Hafner-Fogarty, 2016). While California's efforts protected the practice of telemedicine, the majority of early regulation focused on limiting range of practice to prevent a substantial upheaval to the traditional model of healthcare delivery (Waller & Stotler, 2018). To this end, by 2003 thirty-one states had prohibited out-of-state providers from practicing without a state medical license, thus preventing interstate telemedicine while leaving room for intrastate healthcare systems to establish the practice (Hafner-Fogarty, 2016; Waller & Stotler, 2018).

Given the initial restrictive nature of legislation, development of new laws and regulations for telemedicine remains critical in facilitating expansion of telemedicine care into underserved areas and realizing the benefits telemedicine can bring to a healthcare system. According to the American Telemedicine Association, all 50 American states currently have regulatory efforts in place regarding telemedicine (Thomas & Capistrant, 2017). Efforts are largely focused on expanding access to telemedicine via insurance coverage regulations and developing interstate agreements to facilitate medical care delivery across state lines.

Federal action is also being taken to advance telemedicine. As recently as February 2018 major legislation called the Creating High-Quality Results and Outcomes Necessary to Improve Chronic (CHRONIC) Care Act was signed into law explicitly supporting the use of telemedicine in management of long-term health conditions (American Telemedicine Association, n.d.-b). The CHRONIC Care Act works in conjunction with elements of the Affordable Care Act and Medicare/Medicaid policies to establish a baseline for telemedicine services. The government-

run Centers for Medicare & Medicaid Services describes the following guidelines in its Telemedicine Services Medicare Learning Network Booklet (Center for Medicare & Medicare Services, 2018*)*:

- What type of medical centers can provide telemedicine
- The use of telemedicine for assessment and care planning for chronic conditions
- Which elements of mental health coverage are restricted
- Whether "store and forward" methods of telemedicine can be utilized
- How many telemedicine visits can take place within a certain timeframe

Federal guidelines establish a framework from which individual states can build on via the use of state-based legislations and federal waivers. By example, states such as Kansas, Louisiana and Pennsylvania use the waiver system to allow telemedicine care in personal residences, which is not allowed per the federal telemedicine guidelines, but can significantly benefit patients using remote monitoring to manage their chronic conditions *(*Thomas & Capistrant, 2017*)*. States can also regulate the relative reimbursement rates for telemedicine versus in-person care, thus either incentivizing or demotivating providers from adopting telemedicine practices (Yang, 2016). The result of such substantial legislative power to customize healthcare systems means that significant differences in telemedicine access and utilization exist across the United States (Yang, 2016).

Legal Considerations

In addition to dynamic legislative developments surrounding telemedicine, issues of legal consideration are being navigated by patients and providers and will have significant influence on how telemedicine might be further developed in our healthcare system. Topics such as patient privacy and insurance coverage become complicated in the absence of clearly defined

geographic jurisdictions (Barnes, 2006). Telemedicine situations exemplifying this confusion are numerous. If an international provider treats a patient within the United States – is their healthcare interaction subject to the Health Insurance Portability and Accountability Act (Barnes, 2006)? Is a patient's insurance obligated to provide coverage outside of their traditional geographic zone if a patient can receive more appropriate care from an out-of-area/State provider (McSweeney et al., 2017)? Legislation is not clear on these topics and therefore the potential for different interpretations exists.

Compounding on the legal questions posed above is the substantial legal uncertainty regarding malpractice liability for telemedicine that crosses state lines. Debates arise when trying to define where instances of medical malpractice take place –the location of the medical provider who performed the error, the location of the patient to whom the error affected, or both locations (Barnes, 2006; McSweeney et al., 2017). Patient and providers are inclined to answer this debate differently based on their own perception of where the patient-provider interaction fundamentally exists. From the patient's perspective, it is reasonable to believe that the laws of the state where serviced is received should be enforced, regardless of where the care is originating geographically (Barnes, 2006). However, from the provider's perspective, if services are performed in a certain state, then the location of the physician is technically where the error occurred (Barnes, 2006).

Assigning the true location of care is not a matter of simple semantics but of substantive legal consequence. For a provider, malpractice insurance traditionally covers a local geographic region, and may not extend to the state where the patient is located, leaving the provider unable to pay legal defense fees or pay monetary damages levied against them (Yang, 2016). This is further complicated by the idea that what constitutes medical malpractice is influenced by

standards of care in a particular region, which in turn are based on the unique history of medical case-law in that area (Barnes, 2006). Physicians treating patients in geographies with substantially different case-law history may find themselves susceptible to unfamiliar standards of care, and therefore more vulnerable to litigation. Yet patients receiving care have a reasonable expectation that their medical treatment meet standards of care for their region, regardless of where the care was originating (Barnes, 2006). Balancing these conflicting perspectives to protect both providers and patients is a complex task that healthcare systems and legal scholars must navigate in the practice of telemedicine.

Ethical Considerations

Issues of ethics in telemedicine can be easily overlooked in the midst of the afore described complex legislative and legal considerations. Yet the responsibility and commitment to deliver quality medical care must remain a central guide in the development of telemedicine practice, and to encourage provider and patient adoption of telemedicine both parties must be confident that quality is not being sacrificed. The American Medical Association (n.d.) provides a guideline for "Ethical Practice in Telemedicine" that can help providers navigate ethical issues in telemedicine.

Critical scrutiny of telemedicine programs aims to ensure that the patient-provider relationship is not compromised by the lack of traditional physical interaction during medical care, and that patients are not sacrificing quality of care for convenience of telemedicine (Chaet et al., 2017). Telemedicine programs and providers must be able to demonstrate that their services meet established clinical standards when being handled completely remotely, or have a means of identifying situations where standards cannot be met and patients should be dispositioned to more appropriate in-person medical care (Chaet et al., 2017). Providers must

also be able to gauge the capability of their patients to follow telemedicine treatment plans such as operating home monitoring equipment (Chaet et al., 2017). When such capability does not exist with the patient or their familial/communal support systems, telemedicine may not be the ethically appropriate choice, as too much could be compromised in the quality of outcome.

Conclusion

Telemedicine is at the forefront of healthcare advances that would significantly increase the availability of care to rural, urban, and developing countries, improve patient compliance for a better outcome, decrease the cost of healthcare and reduce the environmental impact of medicine. As a result, the increased need and positive outcomes associated with healthcare have prompted more legislative discussions and changes increasing reimbursement for some telemedicine services, but more work needs to be done to make telemedicine a more viable option for providers and healthcare systems. Despite the numerous benefits associated with telemedicine many patients are still reluctant to use the services and compliance rates, startup costs, and lack of education/training are still barriers based on the studies discussed above. Despite the research available, there are still significant gaps in the literature with regards to why patients are reluctant to use telemedicine. This study will aim to identify what barriers may be keeping patients from acceptance and utilization of telemedicine.

Chapter 3: Methodology

Introduction

The purpose of the research project is to understand public perception of telemedicine, what population uses telemedicine, and identify potential barriers to acceptance and utilization for those who are not using telemedicine. The research question the study addresses is as follows: What are the barriers to patient acceptance and utilization of telemedicine? In order to answer the research question, this chapter outlines the study population, study tool, design, procedure, statistical analysis as well as the validity and reliability of the study tool and limitations and delimitations of the study.

Study Population

Participants in the study were attendees of the Richfield Wellness Expo in the Minneapolis suburb of Richfield, Minnesota, which was held in the gymnasium of Richfield High School on April 13, 2019. The Richfield Wellness Expo was sponsored by the Richfield Public School District, and historically has had approximately 800 attendees of all ages per year. It is important to note that this study was open to any individual over age 18 who attended the Richfield Wellness Expo. The Richfield School District has a varied population consisting of a 40% Latino as well as a large Somali population, so researchers hoped to have a diverse set of respondents. Respondents needed to have sufficient literacy to read and understand the survey. A translator was not provided by the researchers; however, the use of a translator was allowed as no sensitive or identifying information was collected, and all questions were optional, so the use of a translator did not violate a respondent's privacy. Permission to participate this the Richfield Wellness Expo is documented in Appendix A.

Study Tool

Researchers gathered data via an eight question survey exploring population demographics as well as who is using telemedicine, why respondents choose to use telemedicine, and why respondents may choose not to use telemedicine (Appendix B). The survey was available in English and Spanish. For quality control, the Spanish survey was translated back into English (Appendix C). Before use of the survey tool by researchers, an expert panel consisting of members of the Research Committee as well as six community members not affiliated with the research project reviewed the tool. The expert panel was asked to evaluate the clarity of the survey questions and give any additional feedback. Based on the panel's comments the researchers modified several response options and updated terminology to be less technical and more appropriate for a lay audience. Because the survey population consisted of participants over age 18 in the Richfield area, with no discrimination against other demographic factors, the expert panel was considered representative of the survey population.

Study Design

This was a quantitative descriptive study that looked at survey responses collected from voluntary participants at a community health fair. Survey questions were designed to have categorical responses in two distinct sections: 1) demographics and 2) usage rates and impressions of telemedicine. The study design allowed the researchers to effectively measure frequency of responses in each section and to assess correlations between demographics and usage/impressions using the analytical software program Microsoft Excel. The demographics of the Wellness Expo attendees who chose to participate in the survey defined the independent variables in the study and were categorized by age, gender, education level, area of residence,

and number of children in the household. The dependent study variables were the usage rates and impressions of telemedicine of the survey respondents.

Procedure

The research team created survey questions with the intent of elucidating information about the usage and perceptions of telemedicine data. The survey was reviewed by members of the Research Committee and by six community members not affiliated with the research project. As previously described, feedback was integrated into the final revision of the survey to clarify terminology and response options. The survey was reviewed and approved by Bethel University's Institutional Review Board (IRB).

The Richfield Public Schools Community Wellness Expo was selected as the survey location due to its geographically central location in the Minneapolis/St. Paul metropolitan area. It was hypothesized that based on the location and prevalence of both residential and commercial establishments in the area, the Expo would have a demographically diverse group of attendees. Additionally, historical attendance at the expo was estimated to be approximately 800 attendees, which gave the researchers confidence in attaining sufficient sample sizes to allow for statistical analysis.

Paper copies of the survey were taken to the Wellness Expo where the researchers hosted a table offering a drawing for a $50 gift card and healthy food-themed pens and pencils. The researchers interacted with Expo attendees, introduced the PA Program, explained the thesis research project, and communicated that survey participation was voluntary and confidential (see Survey Script, Appendix D). Potential participants were allowed to read the survey consent statements and decline or agree to participate. Expo attendees who agreed to participate were given space and time to complete the survey, with the researchers nearby and available to answer

questions. Completed surveys were dropped into a survey box that ensured results could not be read by Expo attendees.

After the Expo, all survey responses were assigned a unique numeric identifier for the purposes of establishing a link between the paper surveys and the tabulated electronic record of responses. It is noted that the unique identifier had no relation to any personal information of the respondent, were assigned based on random retrieval of surveys from the collection box, and were used for the sole purpose of maintaining traceability in data analysis. The unique identifier and all survey responses were input into Microsoft Excel, and the paper surveys were stored in a locked drawer within the Bethel University Physician Assistant program office. The electronic data was kept on a password-protected computer owned by the researchers while it was analyzed, then was transferred to an external storage device locked in the PA program office. It will be stored for a minimum of five years, per securing requirements for Bethel University's Physician Assistant Program. At the end of the storage period the paper surveys will be shredded by a confidential shredding company and the external storage device will be deleted and formatted to clear the data.

Statistical Analysis

Data from the surveys was collected and sorted using Microsoft Excel. Following this, those who did not complete the survey were excluded from the data analysis. An analysis on the overall demographics of the data was performed by calculating percentage of participants represented in each demographic category. Demographic information that did not contain at least five people in each category was re-grouped such that each category had the minimum number of participants. The overall percentage of participants who use and do not use telemedicine was calculated. A Chi Square analysis was run comparing each of the demographic

factors to usage of telemedicine in order to determine if any of the demographic factors influenced telemedicine usage. After identifying the reasons participants chose either to use or not use telemedicine, a Chi Square was run to determine if any demographic factors correlated with any of these reasons.

Validity and Reliability

The survey used in this study was new, so it had unknown validity and reliability. However, to maximize validity the survey was reviewed by the course instructor and the Research Committee, who all have experience with research and/or telemedicine. Reliability was maximized by designing the survey response options to encompass a thorough list of responses and be clearly differentiated from one another. This helped to minimize participant confusion and ensure that participants understood the various categories. The survey was also reviewed by an expert panel composed of five people who mirrored the participant demographics to further improve reliability and validity.

Limitations and Delimitations

Delimitations. The study conducted by the researchers regarding barriers to telemedicine was limited to surveys provided to adults over 18 years of age in the State of Minnesota, and included urban, suburban, and rural areas surrounding Minneapolis and St. Paul, Minnesota.

Limitations. One important limitation of the study was that the sample size was limited by the number of responses received on the survey. Response rate to the survey directly limited the data set available to be analyzed. Also, a potential response bias was introduced because people who wanted to take a survey may have had differing views from those who tend not to take surveys. Furthermore, the sample size mainly consisted of individuals from the

Minneapolis/St. Paul area, whose opinions may differ as compared to populations of other states or regions. In addition, the researchers wrote the survey questions which may have introduced a potential unintentional bias in the way the survey questions were written. Because the survey or instrument was new, it had unknown validity and reliability.

Conclusion

This study distributed a survey to participants at a wellness expo in Richfield, MN. Questions on the survey included basic demographic factors, frequency of telemedicine use, and reasons why participants choose or do not choose to use telemedicine. Following this data collection process, the data was organized and a statistical analysis performed to determine what factors were significant barriers to telemedicine usage. This analysis of the survey results is discussed in the following chapter, and Chapter 5 discusses the conclusions drawn from the study as well as potential areas for further study.

Chapter 4: Results

Introduction

This study was conducted to determine what factors are significant barriers to telemedicine usage. By learning the significant factors, potential changes could be made to current telemedicine programs in order to increase its effectiveness and improve the healthcare system in the United States. A written survey in both English and Spanish was distributed at the Richfield Wellness Expo on April 13th, 2019 to measure demographics, current frequency of telemedicine usage, and what respondents did or did not like about using telemedicine. This chapter will report the results obtained from the survey.

Demographics

At the Richfield Wellness Expo, eight Spanish surveys and 90 English surveys were completed for a total of 98 respondents. One participant did not complete the survey and one respondent selected more than one answer for one demographic question, so these surveys were excluded from the data analysis. A total of 96 complete surveys were included in the data analysis. The survey respondents were predominantly female with 78% female and 22% male (Figure 1). Only four people reported being 70+ years of age so these respondents were grouped with the 60-69 year old group to make a new demographic age group of 60+ years of age. The survey respondents ages were as follows: 9% were 18-29 years old, 33% were 30-39 years old, 28% were 40-49 years old, 11% were 50-59 years old, and 19% were 60+ years old (Figure 1).

Of the respondents, only two respondents selected the number of children in the household as 5+, so this category was grouped with 3-4 children in the household to make a new demographic category of 3+ children in the household. In the survey, 28% of respondents had 0 children, 49% had 1-2 children, and 23% had 3+ children in the household (Figure 1). Education

level among the survey respondents varied. Only two respondents had completed some graduate school so these were grouped into the college degree group. Also, four respondents had only completed some high school, so they were grouped with the respondents who have a high school degree and the category was renamed "High school diploma or less." Overall, 19% of respondents had a high school diploma or less, 19% had finished some college, 41% had a college degree, and 22% had a graduate degree. Finally, most of the respondents live in a suburban or urban area with 47% living in an urban area, 48% living in a suburban area, and 5% living in a rural

area.

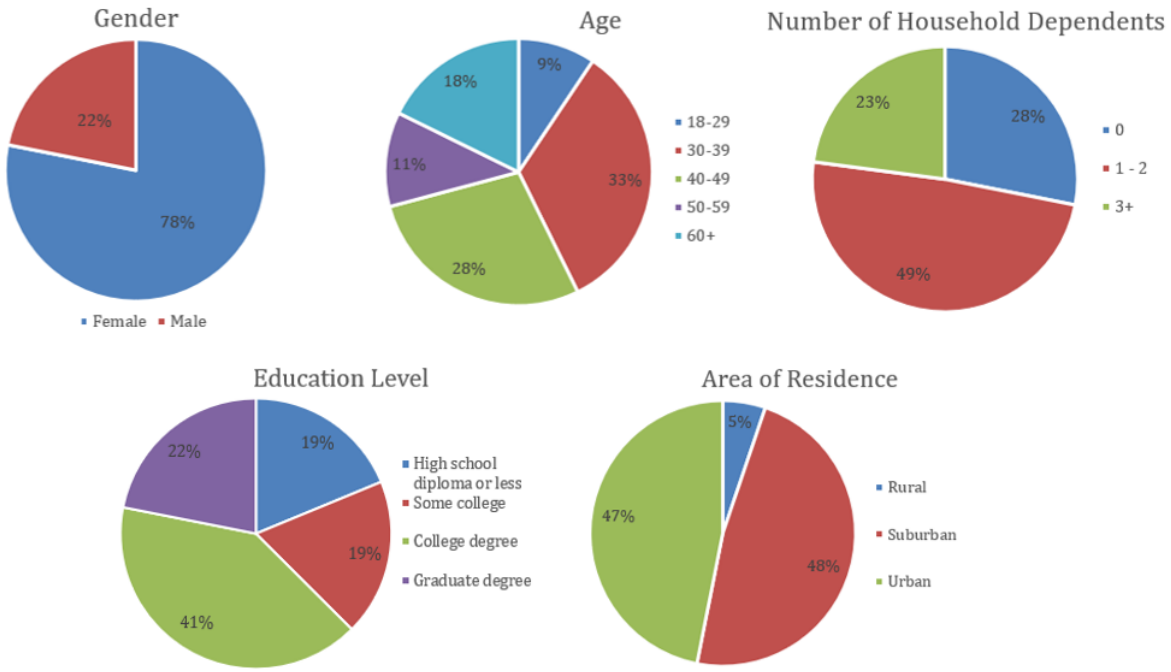

Figure 1. Respondents variance of survey participants' gender, age, number of household dependents, area of residence, and education level.

Demographic Effects on Telemedicine Usage

Question 6 in the survey asked respondents how often they use telemedicine. Only two respondents answered that they use telemedicine monthly and one respondent said they use it

weekly, so both of these groups were included with respondents who responded that they use telemedicine 2-6 times per year and the category was retitled "2+ times per year." Overall, 51% of respondents never use telemedicine, 24% use telemedicine one time per year or less, and 25% use telemedicine two or more times per year.

Next, a Chi Square Test was run to determine if any of the demographic information influenced whether or not a respondent uses telemedicine. During analysis, 0.05 was used as the significance level. The survey data showed that neither gender ($p=0.39$), age ($p=0.27$), number of children in the household ($p=0.31$), or education level ($p=0.09$) significantly influenced whether or not a respondent used telemedicine. However, area of residence did significantly impact whether or not a respondent would use telemedicine ($p=0.03$).

After analyzing the impact of demographic influence on whether or not a respondent uses telemedicine, a series of Chi Square Tests were run to determine if there was a relationship between the demographics of the participant population and the reason a participant uses telemedicine or does not use telemedicine. During analysis, 0.05 was again used as the significance level. Of note, respondents who selected that they do not use telemedicine in Question 6, but also selected another reason that they do use telemedicine in the Question 7 were excluded from the Chi Square Tests comparing selected reasons for use of telemedicine and demographic factors. Similarly, those who responded that they do use telemedicine but selected a reason why they do not use telemedicine in Question 8 were excluded from analysis.

First, of those who use telemedicine, neither gender ($p = 0.69$), education level ($p = 0.86$), area of residence ($p = 0.97$), or rate of usage ($p = 0.69$) significantly impacted the reason the respondent uses telemedicine. However, age did significantly impact why people who use telemedicine choose to do so ($p < 0.001$). Respondents in the age group of 40-49 most often

selected that they use telemedicine because “It saves me time”; whereas those in the 30-39 age group most frequently selected that they use telemedicine because “It’s easy to use” (Figure 2). Respondents in the 18-29, 50-59 and 60+ age group also most frequently selected that they use telemedicine for another reason by selecting “Other” (Figure 2).

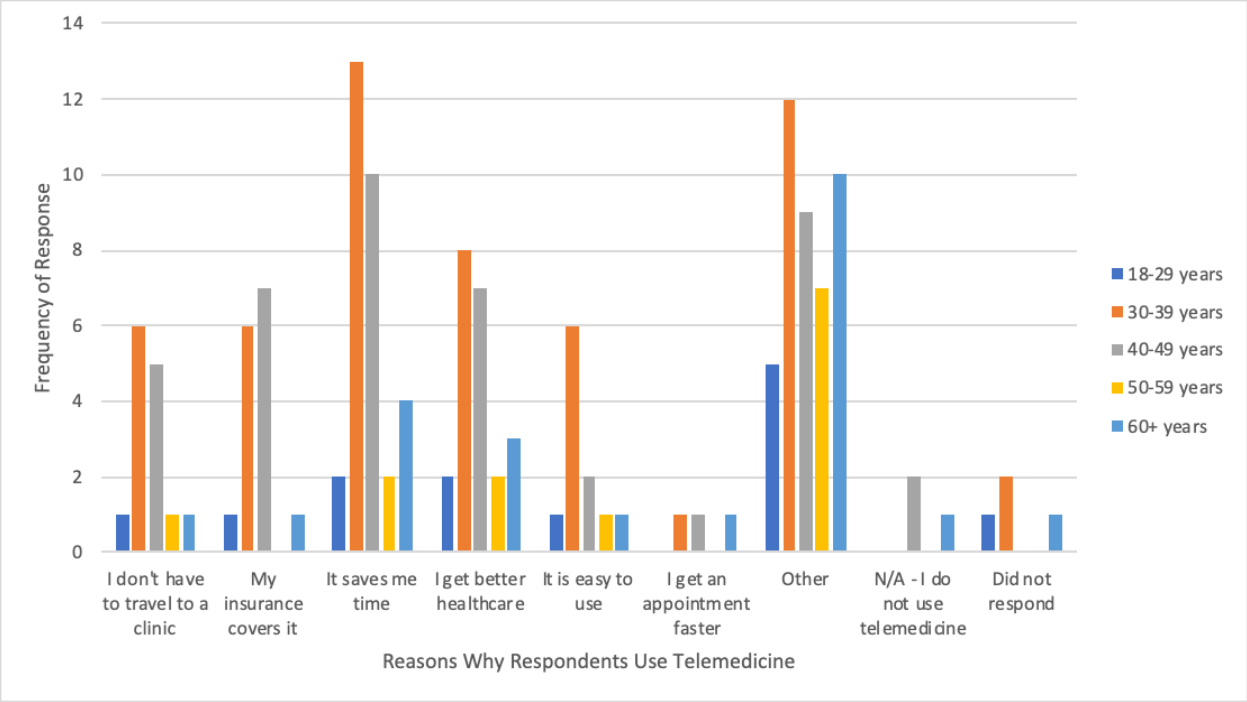

Figure 2. Reasons Why Different Age Groups Use Telemedicine. Respondents in the 40-49 age categories most frequently use telemedicine because “It saves me time.” Respondents ages 18-29, 50-59 and 60+ selected that they use telemedicine for another reason by selecting “Other.” Respondents in the 30-39 age ranges most frequently use telemedicine because “It saves me time.”

The results also indicated that the number of children in the household significantly impacts the reasons why a participant uses telemedicine ($p < 0.001$). Respondents with 0 children in the household as well as those with 3+ children in the household use telemedicine because “It saves me time” (Figure 3). In addition, respondents with 1-2 children in the household most often selected that they use telemedicine because “I get better healthcare” (Figure 3). However, respondents with 1-2 children also frequently selected that they use telemedicine because “It saves me time” (Figure 3).

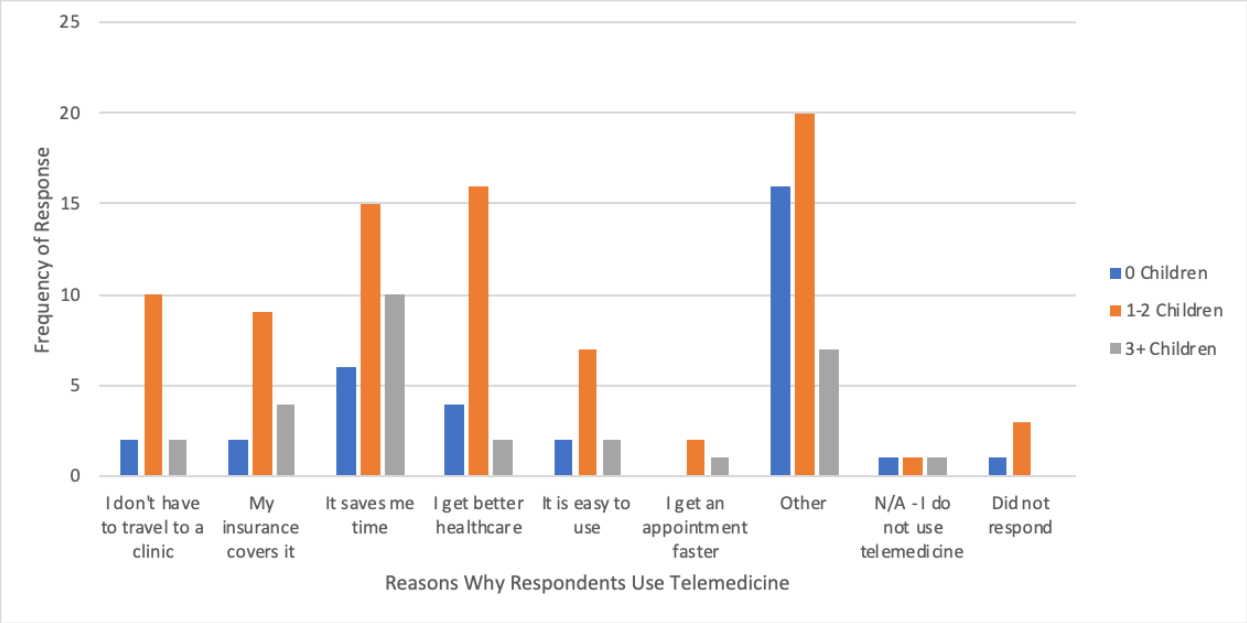

Figure 3. Reasons Why Respondents Use Telemedicine by The Number of Children in the Household. Respondents with 0 and 3+ children in the household most often use telemedicine because "It saves me time." Whereas those with 1-2 children in the household selected that they use telemedicine because "I get better healthcare" and slightly less frequently selected that they use telemedicine because "It saves me time."

The statistical analysis also suggested that the number of children in the household significantly impacts why people choose not to use telemedicine ($p < 0.001$). Respondents with 0 children in the household as well as respondents with 3+ children in the household frequently responded that they do not use telemedicine because "I didn't know how to access it" (Figure 4). However, respondents with 1-2 children most frequently choose not to use telemedicine because "I prefer being seen in person for my healthcare" (Figure 4). In further analyzing the other demographic factors, no significant relationship was found between the reasons respondents choose not to use telemedicine and gender ($p = 0.93$), age ($p = 0.88$), education level ($p = 0.60$) or area of residence ($p = 0.75$). A summary of the statistical analysis can be seen in Table 1 below.

In addition, several participants selection "other" when answering questions 7 and 8 of the survey and chose to write in a different response. These responses will be discussed in the following chapter.

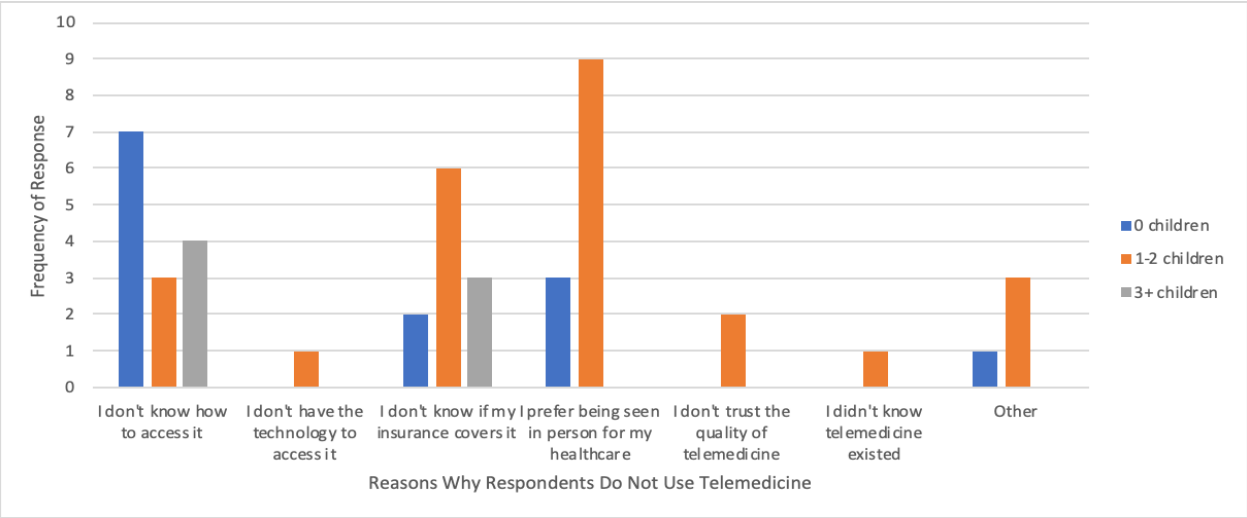

Figure 4. Reasons Why Respondents Do Not Use Telemedicine by Number of Children in the Household. Respondents with 0 and 3+ children most frequently selected that they do not use telemedicine because "I don't know how to access it." Respondents with 1-2 children selected that they do not use telemedicine because "I prefer being seen in person for my healthcare."

Table 1. Chi-square Analysis P-values in Comparing Demographic Information to Telemedicine Usage, Reasons for Using Telemedicine, and Reasons for Not Using Telemedicine

Demographic Data	Telemedicine Usage	Reason for Using Telemedicine	Reason for Not Using Telemedicine
Gender	0.39	0.69	0.93
Age	0.27	**< 0.001**	0.88
Number of Children in the Household	0.31	**< 0.001**	**< 0.001**
Education Level	0.09	0.86	0.60
Geographic Location	**0.03**	0.97	0.75
Telemedicine Usage	N/A	0.69	N/A

Conclusion

Overall, the survey conducted at the Richfield Wellness Expo on telemedicine use contained 98 responses where 96 of these responses were included in data analysis. The data analysis consisted of a Chi Square Analysis that found some significant results. Age was found to significantly impact a respondent's reason for using telemedicine and number of children in the household significantly impacted both reasons for using and for not using telemedicine. The following Chapter 5 will discuss the relationships determined by the analysis and identify any potential barriers that exist to telemedicine usage. It will also discuss potential ways to overcome those barriers, limitations of the study, and areas for future research.

Chapter 5: Discussion

Introduction

The purpose of this study was to determine possible barriers to telemedicine usage. The Research Team hypothesized that demographic characteristics such as gender, age, number of children in the household, education level and area of residence would influence both the rates of telemedicine usage and the reasoning behind those rates. As discussed in the Chapter 4, geographic location, age, and number of children in the household impacted either the rate of telemedicine usage, or the reasoning for using or not using telemedicine. Each of these factors, as well as gender and education level, will be discussed in this chapter to identify potential barriers to telemedicine usage.

Influencing Factors to Telemedicine Acceptance and Utilization

This study sought to identify what barriers prevent acceptance and utilization of telemedicine. Fifty-one percent of survey respondents reported never using telemedicine, and the remaining forty-nine percent reported usage frequencies varying from one time per year to multiple times per year. This result, when correlated against the demographic information collected from respondents, provided insight as to what factors might be influencing the frequency of telemedicine usage.

Gender. Seventy-eight percent of survey respondents were female, but gender was determined to have no significant effect on the rate of telemedicine usage. Due to the lack of published literature on the gender usage rates of telemedicine this result was neither in alignment nor conflict with previous studies. The Research Team considered this result interesting in that it suggests a state of equal opportunity between men and women to utilize telemedicine technology. As discussed in Chapter 2, access to care is a fundamental issue with healthcare in the United States, and if women and men can utilize telemedicine equally, as this data suggests,

then it alleviates one potential barrier to healthcare access. Efforts to broaden the utilization of telemedicine should therefore be targeted to men and women equally.

Regarding the reasons why men and women do or do not utilize telemedicine, again there was no significant correlation with gender. Reasons why both men and women used telemedicine generally included the perception that it saves time and is easy to use. These features could be highlighted by telemedicine providers in their marketing campaigns. Similarly, men and women tended to list a lack of knowledge about telemedicine services (including not knowing if it was available to them or covered by their insurance) and a preference to seeing a provider in person as reasons they do not utilize telemedicine. As such, telemedicine programs might consider a more proactive campaign to educate patients on their services, and may also consider structuring their systems to put more emphasis on the development of a patient-physician relationship even from a remote distance.

Age. The two largest age groups of survey respondents were 30 - 39 years old (33%) and 40 to 49 years old (28%), with representation of age groups 18 - 29, 50 - 59 and 60+ comprising smaller proportions of respondents. Despite this broad range of demographic response age was not found to have a significant effect on whether someone utilized telemedicine. Once again, given the lack of published literature on the age-based telemedicine usage rates, this result was neither in alignment or conflict with previous studies. It was, however, of some surprise to the Research Team that younger respondents were not more likely to utilize telemedicine. This is likely due to an implicit bias of the team about the reluctance or slower adoption of technology services amongst older patients.

When considering why respondents who did utilize telemedicine chose to do so, age was found to be a significant factor. Interestingly, respondents who were 30 - 39 years old were

more likely to select “It’s easy to use” as their reason for using telemedicine, whereas respondents 40 - 49 years old selected “It saves me time” with higher frequency. This result was considered paradoxical by the Research Team, as it would be hypothesized that patients in their 30’s might tend to have busier lives, often juggling careers and young families, and therefore value the time-savings aspects of telemedicine. However, this may be captured in the response of “It’s easy to use,” where busy patients value the ease of telemedicine technology. An additional finding of interest is that the combined age range of 30 - 49 year old respondents were more likely than younger and older respondents to state that they receive better healthcare via telemedicine and to value not having to travel to the clinic.

Regarding respondents who did not utilize telemedicine, there was no statistically significant correlation between age and reason for not using telemedicine. A finding of interest, however, is that across all age groups, there were minimal responses about not having access to technology, not trusting the quality, or not knowing about telemedicine existing. This is an encouraging result for the implementation of telemedicine in that people feel confident in their access to phones and computers to conduct their healthcare, and they do not have a preconceived notion that telemedicine comes with a reduced standard of care.

Number of children in the household. The number of children in the household did not significantly impact usage of telemedicine. This was a surprising result as it was hypothesized that the greater the number of children, the more likely a respondent would be to use telemedicine. However, the number of children did significantly impact a respondent’s reason for using and for not using telemedicine. Respondents with zero or three or more children in the household use telemedicine because it saves them time and respondents with one or two children use it because they believe they receive better healthcare. On the flip side, respondents with zero

or three or more children in the household who choose not to use telemedicine choose not to because they do not know how to access it. Those with one or two children choose not to use telemedicine because they prefer being seen in person.

This was an interesting result because it had been expected that having children in the household would increase a respondent's likelihood of using telemedicine. Studies have found that the usage of telemedicine in schools has saved an average of 3.4 hours of missed work time and between $101 and $224 per visit (Young & Ireson, 2003). Busy parents with many children would be expected to take advantage of telemedicine to save time and money. However, perhaps this does not impact telemedicine usage because many of these busy parents do not know how to access telemedicine and/or they do believe the quality of care for their child will be the same. Even amidst time and money savings, parents still want the best possible care for their children. Also, a busy parent will often not want to take the time to learn a whole new system, but would rather take their child to the clinic in which they are familiar.

Education level. Education level did not impact telemedicine usage, nor did it impact why a respondent chose to use or not use telemedicine. It was expected that those with a higher education level would use telemedicine more because prior studies have found that those with lower education levels were more reluctant to use telemedicine (Sorensen, 2008). This reluctance to use telemedicine by those with a lower education level was not confirmed by this study. However, the original study by Sorensen was done in Denmark, so perhaps in the United States education and health care are different enough than in Denmark that education level does not prevent someone from using telemedicine. Another possible explanation is that because the more educated population is more likely to have a job that provides insurance, these people do

not worry so much about the cost of their visit and are simply seen in person. Those without insurance potentially seek out cheaper health care options such as telemedicine.

Area of residence. Geographic location was found to significantly impact telemedicine usage with rural participants more likely to use telemedicine than suburban or urban participants. This was an expected finding because review of the literature revealed that rural areas often experience a shortage of physicians and especially specialty physicians (Young & Ireson, 2003). Because of these shortages, patients often must drive hundreds of miles to receive or forgo receiving any care at all (Qiang & Marras, 2015). Telemedicine has the capability to solve many of these access to care problems in rural communities because it allows patients to receive care without driving hundreds of miles. This is likely why rural participants were more likely to use telemedicine than suburban or urban participants, where clinics are often a few miles from home. While area of residence did significantly impact telemedicine usage, it did not significantly impact a participant's reason for using or not using telemedicine.

Recommendations for the Improvement of Telemedicine

As was discussed in Chapter 2, telemedicine has many benefits including the potential to increase access to care and lowering the cost of healthcare. Telemedicine thereby has the potential to help alleviate two major problems in the current healthcare system in the United States. For this reason, it is important to find ways to increase telemedicine usage among patients. Overall, the survey found that participants who do not use telemedicine choose not to use it mainly for three reasons: they do not know how to access it, are unsure if their insurance covers it, and/or prefer being seen in person for their healthcare. Based on these results, a potential solution would be a marketing campaign to reach out to patients explaining how telemedicine works, how to access it, and the potential benefits of using it. Clinic providers or

clinic staff could hand out this information while patients are in the clinic. Insurance companies could also provide customers with information detailing coverage based on his or her specific insurance plan and incentivize patients to use telemedicine in order to save money and drive down healthcare costs. Finally, to increase patient confidence in using telemedicine, providers could be required to undergo specific training on telemedicine. This could help patients who prefer to be seen in person have confidence that they will still be receiving quality care virtually.

Limitations

Although the survey conducted yielded useful data, potential limitations must be discussed. One potential limitation is the survey population was only attendants of the Richfield Wellness Expo in Richfield, Minnesota, which imposed limitations both by geographic location and the number of attendees at the expo. According to the data collected, attendants of the Richfield Wellness Expo that took the survey were by majority female from an urban area. Therefore, a limitation of the study would be the demographics of the respondent population. Specifically, the rural population was the least represented in the data and, according to the literature review conducted in Chapter 2, one of the demographic groups most in need of telemedicine.

In addition, the location and type of event may have limited the survey data. Because the data was collected at a wellness expo, it is possible that these individuals are more likely to access medical care and therefore may be more likely to use telemedicine, further limiting the data that could be collected on true barriers to telemedicine usage. Also, the survey tool utilized was both created and used by researchers, so unintentional bias may have been introduced into the survey tool and the reliability and validity of the tool is undetermined which may have further limited the study conducted.

Finally, because the design of the study was a survey, where there are neither controls or manipulated variables, it is difficult to draw any definitive conclusions or determine a causal relationship between the potential barriers and usage of telemedicine.

Further Research

Due to the lack of research in the area of telemedicine and the exponential growth of technology in recent years, more research is needed to further understand how telemedicine is being used and what may be limiting telemedicine usage. Due to the fact that the survey conducted was limited by the demographic, geographic and time constraints listed above, an important area of further research would be to expand the survey to a broader population and attempt to collect more data from rural respondents. In addition, expanding the geographic location outside of Minnesota could help gain an understanding of how other states may be utilizing telemedicine as well as identify barriers that exist outside of Minnesota. Another area of research may be surveying telemedicine providers to understand the barriers providers face when using telemedicine and how that impacts care on the front side of telemedicine.

Additionally, further research could be done looking at the potential barriers identified by the study in an attempt to gain more information as to why those barrier exists. For example, one of the barriers listed is that patients prefer to be seen in person. Further research may include conducting a study to understand why patients prefer to be seen in person. Finally, one other area for further potential research is to develop a valid and reliable tool to measure telemedicine usage and then utilizing the tool to determine the effectiveness of suggested telemedicine marketing strategies on telemedicine usage both before and after implementation.

Conclusion

Telemedicine provides significant opportunity to leverage technology to improve human health. As discussed in Chapter 2, studies have shown telemedicine provides benefits to both the patient and healthcare system by decreasing cost and increasing convenience. Despite these benefits, very little data exists on telemedicine usage.

This study was conducted to gather data on the demographics of who is using or not using telemedicine, and for those not using telemedicine, the potential barriers to usage. The goal was to identify barriers that would allow healthcare systems to implement marketing strategies or manipulate current telemedicine platforms to be more accessible to a broader population of patients. The data collected and analyzed from the Richfield Wellness Expo identified some potential barriers such as lack of knowledge on how to use telemedicine, insurance coverage uncertainty and/or a preference for being seen in person. The Research Team suggested overcoming these potential barriers by creating literature aimed at patient education on telemedicine, providing plan-specific insurance benefit information to the patient, incentivizing the use of telemedicine and creating a standardized, effective telemedicine training program for providers. Taking measures to promote telemedicine programs will help alleviate burdens within the healthcare system and advance patient care. For in the age of technology, where time is measured in milliseconds, space in gigabytes, and geographic boundaries are non-existent, why should medical care be delivered over hours to days and be confined to four brick walls?

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APPENDIX A

Permission to participate in Richfield Wellness Expo

Fwd: Richfield Wellness Expo confirmation

From: **Community Education**
<communityeducation@rpsmn.org>
Date: Sun, Mar 10, 2019 at 3:55 PM
Subject: Richfield Wellness Expo confirmation
To: Carole McNaughton-Commers <c.mcnaughton-commers@rpsmn.org>, Community Education
<communityeducation@rpsmn.org>

Only one month away!

Richfield Public Schools' Community Wellness Expo

This email confirms your participation on **Saturday, April 13th** with an interactive exhibit or activity from 9am-12noon at the Richfield High School.

1. Your requested number of tables is confirmed. Please note, some exhibits will have round tables, approximately 5 feet by 4 feet, with detached chairs. Others will be rectangular lunch tables with chairs attached.

2. You will receive the exhibit location map and more details approximately April 5th.

3. Plan to arrive after 7:30am and be completely set up by 8:45am. The Expo doors open promptly at 9am and close at 12noon.

Thank you for joining us in this great community connection event. Please contact us with any questions.

Community Education Central Education Center 7145 Harriet Ave
Richfield, MN 55423
p: 612-243-3000
f: 612-243-3067
communityeducation@rpsmn.org

Richfield Public Schools ***inspires*** and ***empowers*** each individual to learn, grow and ***excel***

APPENDIX B

Survey (English)

Telemedicine Survey

This survey is part of a research study conducted in partial fulfillment of the requirements for a Masters Degree in Physician Assistant Studies at Bethel University. The survey has been approved by Bethel University's Institutional Review Board. Our study is investigating how often people in the Minneapolis and St. Paul area use telemedicine. Our hope is to learn why people choose to use or not use telemedicine.

By completing this survey, I consent to take part in this research project and understand that I may withdraw from the survey at any time without penalty. I also understand that this survey will be kept anonymous and no personal identifying information will be collected or recorded.

Demographics (Please select one)

1. **Gender**
   - ❑ Male
   - ❑ Female
   - ❑ Other
   - ❑ Prefer not to answer
2. **Age**
   - ❑ 18-29
   - ❑ 30-39
   - ❑ 40-49
   - ❑ 50-59
   - ❑ 60-69
   - ❑ 70+
3. **Number of children in household**
   - ❑ 0
   - ❑ 1-2
   - ❑ 3-4
   - ❑ 5+
   - ❑
4. **Highest Education Level Completed**
   - ❑ Some high school
   - ❑ High school diploma
   - ❑ Some college
   - ❑ College degree
   - ❑ Some graduate school
   - ❑ Graduate degree
5. **Area of residence**
   - ❑ Urban *(>50,000 people)*
   - ❑ Suburban *(2,500-50,000 people & near urban area)*
   - ❑ Rural *(not urban or suburban)*

Telemedicine Use

Telemedicine: the use of technology to provide healthcare to a patient remotely

Examples of technology:

- *Using video conferencing to meet with a healthcare provider*
- *Phone calling in to a nurse helpline*
- *Messaging a healthcare provider on a secure online system like Virtuwell*

6. **How often do you use telemedicine services either for yourself or a family member? (Check one)**
   - ❑ Never
   - ❑ 1 time per year or less
   - ❑ 2-6 times per year
   - ❑ Monthly
   - ❑ Weekly

7. **I use telemedicine because: (Check all that apply)**
   - ❑ I don't have to travel to a clinic
   - ❑ My insurance covers it
   - ❑ It saves me time
   - ❑ I receive better healthcare
   - ❑ It is easy to use
   - ❑ I am seen by a healthcare provider faster
   - ❑ Other: _____
   - ❑ N/A - I don't use telemedicine

8. **I do <u>NOT</u> use or like telemedicine because: (Check all that apply)**
   - ❑ I didn't know telemedicine existed or how to access it
   - ❑ I don't have the technology to access it (internet access, computer, etc.)
   - ❑ I don't know if my insurance covers it
   - ❑ I prefer being seen in person for my healthcare
   - ❑ I don't trust the quality of telemedicine
   - ❑ My healthcare provider does not offer telemedicine
   - ❑ Other: _____
   - ❑ N/A - I do use telemedicine

Thank you for participating in our research survey. Contact Information:

Katie Vraspir – katie-vraspir@bethel.edu
Sarah Strenke – sarah-strenke@bethel.edu
Carolyn Majkrzak – carolyn-majkrzak@bethel.edu

APPENDIX C

Survey (Spanish)

Encuesta de telemedicina

Esta encuesta es parte de un estudio de investigación realizado en cumplimiento parcial de los requisitos para un título de Maestría en Estudios de Asistente Médico en la Universidad de Bethel. La encuesta ha sido aprobada por la Junta de Revisión Institucional de la Universidad de Bethel. Nuestro estudio investiga con qué frecuencia las personas en el área de Minneapolis y St. Paul utilizan la telemedicina. Nuestra esperanza es aprender por qué las personas eligen utilizar o no la telemedicina.

Al completar esta encuesta, consiento participar en este proyecto de investigación y entender que puedo retirarme de la encuesta en cualquier momento sin penalización. También entiendo que esta encuesta se mantendrá anónima y no se recopilarán ni grabará ninguna información de identificación personal.

Demografía (Por favor seleccione una)

1. Género

- ❑ Masculino
- ❑ Mujer
- ❑ Otro
- ❑ Prefiero no contestar

2. Edad

- ❑ 18-29
- ❑ 30-39
- ❑ 40-49
- ❑ 50-59
- ❑ 60-69
- ❑ 70 +

3. Número de niños en el hogar

- ❑ 0
- ❑ 1-2
- ❑ 3-4
- ❑ 5 +

4. Nivel de educación más alto completado

- ❑ Alguna escuela secundaria
- ❑ Diploma de escuela secundaria
- ❑ Algunos universitarios
- ❑ Título universitario
- ❑ Alguna escuela de posgrado
- ❑ Postgrado

5. Área de residencia

- ❑ Urbano *(> 50.000 personas)*
- ❑ Suburbano *(2500-50000 personas y cerca de la zona urbana)*
- ❑ Rural *(no urbana o suburbana)*

Uso de telemedicina

Telemedicina: el uso de la tecnología para proporcionar atención médica a un paciente de forma remota

Ejemplos de tecnología:

- *El uso de videoconferencias para reunirse con un proveedor de atención médica*
- *Teléfono llamando a una línea de ayuda de enfermeras*
- *La mensajería de un proveedor de atención médica en un sistema en línea seguro como Virtuwell*

6. ¿Con qué frecuencia utiliza los servicios de telemedicina tanto para usted como para un miembro de su familia? (Marque uno)

❑ Nunca
❑ 1 vez al año o menos
❑ 2-6 veces al año
❑ Mensual
❑ Semanal

7. Utilizo la telemedicina porque: (Marque todas las que correspondan)

❑ No tengo que viajar a una clínica
❑ Mi seguro lo cubre
❑ Me ahorra tiempo
❑ Recibo una mejor atención médica
❑ Es fácil de usar
❑ Soy visto por un proveedor de atención médica más rápido
❑ Otro: _ _ _ _
❑ N/A-no utilizo la telemedicina

8. <u>No</u> utilizo la telemedicina porque: (Marque todas las que correspondan)

❑ No sabía que existía la telemedicina ni cómo acceder a ella
❑ No tengo la tecnología para acceder a ella (acceso a Internet, computadora, etc.)
❑ No sé si mi seguro lo cubre
❑ Prefiero ser visto en persona para mi salud
❑ No confío en la calidad de la telemedicina
❑ Mi proveedor de atención médica no ofrece telemedicina
❑ Otro: _ _ _ _
❑ N/A-utilizo la telemedicina

Gracias por participar en nuestra encuesta de investigación.

Información de contacto:
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APPENDIX D

Survey Script

Survey Script

Hello , my name is _____ and I am a Physician Assistant student at Bethel University. Would you be willing to take our survey on the use of telemedicine? It should only take 1 or 2 minutes and is completely confidential; we will not be collecting any personal information.

If expo attendee says they do not know what telemedicine is, say:

"Telemedicine is the use of technology to provide healthcare related services to someone remotely. This might include using a communication or portal system to send messages to your doctor, using a phone helpline to talk to nurse, or using an App or video-conference to meet with a healthcare provider, like the Virtuwell service."

If expo attendee agrees, skip to script B.

If expo attendee declines, proceed to script A.

A. Ok, we understand!

Please feel free to take a XXXXXX *or* We are offering complimentary XXXXX if you are interested.

(XXXXXXX will depend on what "extra" we have at our booth - either a food, or a simple health screening - this is TBD based on recommendations from the expo organizers.)

B. Thank you!

Here is a copy of our survey. If you have any questions, please ask me or my classmates _____ & _____; we would be happy to help you. Once you are done just put the survey in the box and the clipboard back on the table. Then feel free to take a XXXXXXX or let us know if you would like a XXXXXX.

APPENDIX E

Bethel University IRB Approval

4/01/2019

Carolyn Majkrzak, Sarah Strenke and Katie Vraspir

As granted by the Bethel University Human Subjects committee as the program director, I write this letter to you in approval of Level 3 Bethel IRB of your project entitled: "Understanding Public Perception of Telemedicine." This approval is good for one year from today's date. You may proceed with data collection and analysis. Please let me know if you have any questions.

Sincerely;

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CC: Bethel IRB Chair
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