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Barriers to the Implementation of Telehealth in Rural Communities and Potential Solutions

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BARRIERS TO THE IMPLEMENTATION OF TELEHEALTH IN RURAL COMMUNITIES
AND POTENTIAL SOLUTIONS

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A senior paper submitted in partial fulfillment
of requirements for the degree of
Bachelor of Science in Nursing
Anna Vaughn College of Nursing
Oral Roberts University
May 2020

Acknowledgements

First, thank you Jesus for the ability to write this paper and for the privilege to attend university.

Thanks Mom and Dad for the emotional support.

Thank you for all your guidance, Dr. Swanson.

Utukufu kwa Mungu.

Abstract

Telehealth is an ever-growing health care system, providing health services from a distance. Telehealth provides medical care through teletechnologies and two-way video and audio communication to connect doctors to patients. A detailed review was created to show the barriers and interventions of implementing a telehealth program in a rural area. The overall purpose of the systematic review was to find and explore relevant research and answer the question, “What are commonly encountered barriers to implementing telehealth in rural areas and what interventions can nurses implement to overcome these barriers?” The approach used to obtain quality data and research was convenience sampling through the ORU databases. Thematic analysis was used to evaluate the research found and to answer the research question. After critiquing fifty articles, a final sample was comprised of twenty-four articles. Findings from this systematic review revealed the top six categories of barriers and their accompanying interventions for the implementation of telehealth encompassed technology, education, health systems, finances, privacy, and cultural considerations. Despite the barriers the positive outcomes of the implementation of telehealth is the opportunity it gives to provide medical services to underserved populations in rural areas. Its purpose is to positively increase a patient’s health and well-being who would otherwise not have access to medical care.

Keywords: telehealth, intervention, barrier, implementation, rural, communities

Barriers to the Implementation of Telehealth in Rural Communities and Possible Solutions

The constant evolution of technology has allowed society to have easy access to a vast network of knowledge and resources. In the realm of healthcare, this advancement is no different. Technology has aided in the creation of advanced medications, cutting-edge imaging and the merging of telecommunication and healthcare. When medical professionals from around the world met at the World Health Assembly in Switzerland in 2018, the majority agreed that emerging digital technologies were the key to improving public health in the future (Chakrabarti, 2018). One such medical-technological advancement is the utilization of telehealth. Telehealth has the potential to be used by the medical community not only in the United States but also in developing countries where primary care is not as easily accessible (World Health Organization, 2009).

Background

According to the World Health Organization (WHO), telemedicine is simply defined as “healing at a distance” (Ryu, 2012). The word telemedicine comes from the Greek prefix “tele” or “telo” which means distance--an appropriate statement since telemedicine allows electronic communication to connect patients in rural areas to doctors who are often far away (Aziz & Abochar, 2015). Telehealth uses two-way video and audio to connect doctors in different geographical locations to other medical professionals, medical facilities and patients in their homes (Pollard, Karimi, & Ficcaglia, 2017). Telehealth can also provide medical services and education through telecommunication technologies--allowing a reduced price, while still providing high-quality medical solutions to help families who have limited access to medical care. In general, the terms telehealth and telemedicine can be used fairly interchangeably, however, more specifically, telehealth often refers to the technology itself while telemedicine

covers the delivery of the care (Aziz & Abochar, 2015; Pollard et al., 2017). Despite these slight nuances, for the purposes of this paper, the term telehealth will be used.

Despite the use of modern technology, telehealth has been around longer than some might think. Some trace its roots all the way back to the use of heliographs during the outbreak of the Bubonic Plague in Europe, but most recognize the Civil War as the true advent of telehealth. In the 1860's, field doctors sent telegrams to other doctors who were not currently serving on the frontline to get medical advice on how to treat their wounded soldiers even from afar (Aziz & Abochar, 2015; Scott & Mars, 2015). The medical world took another step towards using telehealth when Dr. Alexander Graham Bell invented the telephone, as this opened the door for doctors to send electrocardiograms over telephone lines (Houston, Stredler-Brown, & Alverson, 2012). Even though it has existed since the 19th century, it was not until the 1960's and 1970's that this type of medical communication was labeled telehealth (Aziz & Abochar, 2015). Considering more modern technology, Norfolk State Hospital and Nebraska Psychiatric Institute in Omaha were the first hospitals to use video in their communication. When the National Aeronautics and Space Administration (NASA) began to use telehealth to monitor the health of astronauts while in space, the method of communication developed even greater respect (Aziz & Abochar, 2015). The manager of telehealth programs for WakeMed home health, Juanita Hood, expressed the importance of having constant health supervision at home for specific patients in rural and urban areas. This system allows doctors to have face-to-face contact with their patients via telehealth video, while an in-home machine is gathering vital information about the patient. Due to more frequent interaction with and assessment from their provider, patients are able to get the medical attention they need and have decreased potential for developing further complications (J. Hood, personal communication, February 7, 2019).

In the United States (U.S.), 21% of citizens live in rural areas, and two-thirds of these rural residents live below the poverty level (Pollard et al., 2017; Schlichler & Haddock, 2016). Because of location and limited resources for extended travel, these families do not always have access to sustainable medical facilities (Pollard et al., 2017). Though it may be natural for physicians to cluster in areas like cities where they are in highest demand, statistics show that only 12% of emergency physicians practice in rural America, and of that small portion, only 31% have official emergency medical training (Schlichler & Haddock, 2016). Not only is there a shortage of access to medical care in the rural communities of the United States, but this issue is also prevalent across the globe. In the country of Malawi, there are shortages of nearly all healthcare providers, and in Uganda, there is only one healthcare worker for every 600 people. For every 70,000 Malawians, only one doctor is available, and 51% of positions for medical doctors remain unfilled. To make matters worse, most healthcare workers choose to work at central and district hospitals, as rural areas have limited resources (Bisson, Teixeira & Matemba, 2014). It is clear that access to medical care is often limited in the rural communities, and such limitations pose serious threats in the lives of those who live in those areas.

Significance

In the U.S., populations living at risk for impaired health can be found in rural areas (Warshaw, 2017). Many rural communities experience a lack of resources, a scarcity of local doctors and remote locations--making healthcare difficult to provide (Warshaw, 2017). Lower income and traveling complications hinder rural residents, as the occupations that are common in rural communities often prevent them from taking the time off that is necessary for making the long trip to visit the doctor due to the time-intensive nature of rural occupations (Warshaw, 2017). The same issues exist on the global stage, as common occupations in rural communities,

such as agriculture, construction and mining, pose inherent risks which may increase the potential for injury and fatality (World Health Organization, 2018).

Because many rural patients often fail to seek healthcare in a timely manner, some issues that could have been more easily treated can progress to dangerous or untreatable stages (Warshaw, 2017). For instance, rural areas experience higher rates of infant mortalities, psychological disorders, and cancers from preventable lifestyle factors, and screenings for some types of cancer are lacking (Warshaw, 2017). The progression of these health issues are only accelerated by common exposure to pollutants, chemicals, and infectious diseases that commonly present in rural communities (World Health Organization, 2018). As a result, nurses often encounter patients with advanced problems that could have been decreased had care been more accessible in earlier stages of sickness. Telehealth can assist healthcare professionals to bridge the gap that exists in rural areas.

Though these matters may seem daunting, nurses and other health professionals have already played an important role in using telehealth to remedy healthcare issues in other settings (McHugh, Krinsky, & Sharma, 2018). For instance, one pilot program in a New York City emergency department involved nurses triaging admits and offering the option of a telehealth consultation with an on-call doctor for minor illnesses and injuries. The project found that patient satisfaction rates increased and patient wait times decreased significantly. Nurses played a major part in the development of this program, and it provided a solution to the large volume of patients that present in the emergency department—a barrier to providing timely and quality care (McHugh et al., 2018). A similar exploratory study was done with participants in Mississippi to assess the effectiveness and satisfaction rates of electronic mental health consults. The study concluded that mental telehealth was not only effective in providing care but was

preferred by patients to be seen within the privacy of their personal surroundings (Holland, Hatcher, and Meares, 2018). Mental health services are rare in rural areas--making it a challenge and a burden for patients to travel to receive adequate mental health care (Holland et al., 2018). The success of this tele-mental health pilot indicates a possible solution to this lack of mental health care. In addition, patients in rural areas suffer from higher rates of preventable comorbid diseases along with higher substance abuse levels which contribute to increased mental health issues. According to an innovation guide from the American Nurses Association, in order to more successfully help patients, health professions will have to make major changes and incorporate innovation— specifically telehealth (Cianelli, Clipper, Freeman, Goldstein, & Wyatt, 2016).

One of the primary roles of a nurse is to educate the patient, family and community. Often communities that aren't densely populated suffer from being isolated from professionals-- leading to a gaping lack in education (Brauer, 2016). The use of telehealth allows nurses to participate in remotely educating patients that need medical guidance. The foundation to socioeconomic development is having members of a community adequately educated and trained in healthcare basics (Brauer, 2016). Furthermore, when nurses educate members of a community, it empowers the community to take ownership of and participate in their own health promotion (Brauer, 2016).

Problem and Purpose Statement

Because of rural health disparities, the need for telehealth to provide adequate health care and education becomes evident. However, the implementation of new technology in an established system of medicine may present many problems--particularly in contexts with limited resources. Nurses are in an optimal position to connect quality health care with the

global population. By identifying the barriers that are commonly encountered when implementing telehealth, health care professionals can more effectively actualize access to health care via telehealth in rural areas across the world (World Health Organization, 2018). The purpose of this systematic research review was to search current literature to answer the question “What are commonly encountered barriers to implementing telehealth in rural areas and what interventions can nurses implement to overcome these barriers?”

Definition of Variables

The population variable for this study was rural areas. The United States Census Bureau defines rural areas as any area, people or infrastructure that is not in a city (McSweeney, Pritt, Swearingen, Kimble, & Coustasse, 2017). Rural areas are classified by the limited amount of services to which the population has access--as well as the distance someone has to travel in order to reach a large center. This definition can vary depending on the size of the country, the distribution of the population, and the transportation framework (Goodridge & Marciniuk, 2016). In addition, limited infrastructure and inaccessible roadways can also be used to define a rural area (Laar, Bekyieriya, Isang, & Baguune, 2019; Ramkumar, Nagarajan, Shankarnarayan, Kumaravelu, & Hall, 2019).

In this research review, the term barriers functions as both a dependent and an independent variable. Society as a whole experiences roadblocks or barriers in everyday life. However, in the scope of nursing practice, barriers can result in the disruption of the adoption of new practices, products or provisional care due to administrative choice (Schwamm et al., 2017). This term can also be related to the location of the implementation of care (Alaboudi et al., 2016). Further, “barriers” can be defined as a potential delay in care that can result in harm for patients (Schwamm et al., 2017).

Another independent variable was interventions. Nursing interventions are often known as the tasks nurses perform to care for patients. Broadly defined, interventions can represent a variety of treatments nurses perform as well as communications given to individuals, families, communities, members of other disciplines and the general public (Butcher, Bulechek, McCloskey, Dotcherman, & Wagner, 2018). This term can also be defined as the optimization of one's health to prevent illness, provide comfort and continually advocate for the patient, families, the community and the population as a whole (Honan, 2013). In a concise definition for the purposes of this paper, nursing interventions are actions performed by the nurse to promote the health and wellness of the patient and others around them, through the use of telehealth.

Finally, the term implementation functions as a dependent variable in this research review. For the purpose of this study, the term “implementation” is defined as the process of executing or putting a plan into action. Telehealth uses video messaging with audio to connect doctors in different geographical locations to other medical professionals, medical facilities and patients in their homes (Pollard et al., 2017). The implementation of telehealth is to carry out the action of connecting patients in a rural area with doctors or other medical professionals, through the use of digital media.

Methodology

This systematic research review was conducted between March and September 2019. The databases used included CINAHL Complete, Google Scholar, Medline with full text, EBSCO, Medline (MESH), Sage Journal, and Academic Search Complete. The search terms used were telehealth, barriers, implementing, models of telehealth, telemedicine, rural areas, barriers or obstacles or challenges. The databases and search terms used provided the most

comprehensive results on the topic of interest. The total number of hits from all the searches were over one-hundred-thousand. Scanning the titles of articles followed by reading article abstracts and then reading the entire article allowed the researchers to narrow the results with a multi-step process. The inclusion criteria for the searches were that articles were written in the English language, published within the last five years, peer reviewed and in full text. These inclusion criteria assisted in eliminating excessive and/or inconsequential information from the search in order to best facilitate the discovery of material to answer the research question. Fifty studies were critiqued for quality, rigor and the ability to answer the research question. After eliminating those that did not critique well, the final sample was comprised of twenty-four articles.

Findings

The literature review was made up of twenty-four articles. Eight of the studies were systematic reviews (Alaboudi et al., 2016; Goodridge & Marciniuk, 2016; Koivunen & Saranto, 2018; Kruse et al., 2018; McSweeney et al., 2017; Sanchez, Reiner, Sadlon, Price, & Long 2019; Schwamm et al., 2017; Watzlaf, Zhou, DeAlmeida, & Hartman 2017). Another eight studies were quantitative studies (Bhatt et al., 2018; Brown, Schmitz, Scott, & Friesner, 2017; Driessen, Castle, & Handler, 2018; Jacobson & Hooke, 2016; Odhiambo & Mars, 2018; Sabesan et al., 2018; Sener et al., 2018; Sutcliffe et al., 2017). The remaining eight studies were qualitative studies (Abejirinde et al., 2018; Dingwall, Puszka, Sweet & Nagel 2015; Duclos et al., 2017; Hampshire et al., 2017; Jayasinghe, Crowder, & Wills, 2016; Liu et al., 2019; Taylor, Coates, Wessels, Mountain, & Hawley, 2015; Thobias & Kiwanuka, 2018). The following tables highlight the most relevant information from each of the studies.

Table 1

Barriers to Telehealth Implementation

Author/Year	Type of Study/level of evidence	Sample Size	Barriers
Abejirinde et al., 2018	Qualitative study (IV), individualized, focused group	20	-Participants were fearful on initial reaction of Mhealth device. -Literacy levels of device didn't always match patient literacy level.
Alaboudi et al., 2016	Systematic Research review (IV)	8	-Inadequate sustainable funding -No shared vision of telehealth among workers
Bhatt et al., 2018	Quantitative (II)	8686	-unstable mobile connectivity -limited to poor cellular coverage -significant amount of time to receive screening report submissions -technological challenges -breakage, wear and tear of equipment
Brown et al., 2017	Quantitative (II)	18	-Location
Dingwall et al., 2015	Qualitative Study (IV)	15	-Need more language options -No data or cell phones -Less words, more visual appeal for app
Driessen et al., 2018	Quantitative Study (IV)	15	-Initial investment -Cost to maintain the equipment -Cultural considerations -Learning process
Duclos et al., 2017	Qualitative group and semi-structured individual interviews (IV)	187	-Lack of internet connectivity and power -Concern of increased workload (staff) -Concern that husbands will not let wives use their phones (trust/social issues) -Concern about confidentiality
Goodridge & Marciniuk, 2016	Systematic research review (IV)	13	-lack of technology for patient - no sustainability of telehealth network -No scalability of network -legal problems with patient safety
Hampshire et al., 2017	Qualitative interview and opportunistic sampling. Exploratory study (IV)	34	-financial burden of service falling on health provider -losing or not having use of phone -limited and inconsistent phone service
Jacobson & Hooke, 2016	Quantitative Study (II)	12	-Forgetting how to video call -Contracts with video conferencing companies -Privacy
Jayasinghe et al., 2016	Qualitative Study (IV)	72	-Internet coverage -Staff and population reception -Education level -Internet literacy -Implementation of new policies -Hospital infrastructure
Koivunen & Saranto, 2018	Systematic research Review (IV)	3000	-Care via Telephone impersonal -Lack of resources to implement -Knowledge deficit

Author/Year	Type of Study/level of evidence	Sample Size	Barriers
Kruse et al., 2018	Systematic Research Review (IV)	30	-Privacy & confidentiality -Resistance to change -Availability of tech support -Computer literacy -Language barrier
Liu et al., 2019	Qualitative individual interviews (IV)	29	-lack of patient understanding about need for screening -insurance did not cover teleophthalmology -lack of understanding/familiarity -difficulty of doctors to access patient info -not enough understanding by workers to educate patient -transportation issues -time constraints for doctors -doctor's concern about local competition
McSweeney et al., 2017	Systematic research review (IV)	29	-The absence of program funds -lack of reimbursement -Inability to obtain providers' licensure at the state level
Odhiambo & Mars, 2018	Quantitative convenience sampling survey (III)	92	-terms of informed consent are not understood even in native language
Sabesan et al., 2018	Quantitative retrospective descriptive analysis statistics. (IV)	62	-Turnover and need for new training of staff -Interruption of internet connection
Sanchez et al., 2019	Systematic Research Review (IV)	20	-Finances are not there to support more nurses in the telehealth field for schools
Schwamm et al., 2017	Systematic Research Review (IV)	15	-New providers to telehealth make treatment decisions based on inaccurate patient data -Purchase of telehealth, cost of maintenance and upkeep of equipment -Lack of technological access -Lack of security and privacy -Out of state physicians practicing under patient's state laws
Sener et al., 2018	Quantitative experimental control study (II)	204	-concerns about patient confidentiality (whatsapp solution) -difficulty was encountered when trying to instruct patients how to take necessary pictures
Sutcliffe et al., 2017	Quantitative Study (II)	419	-Access to telephone/telecommunication
Taylor et al., 2015	Qualitative (IV)	105	-Restructuring nursing teams -Changing health system -Financial investment and training program -patients limited use of equipment -Equipment does not accurately obtain data -No established installation program
Thobias & Kiwanuka, 2018	Qualitative participatory action approach (IV)	23	-cultural barrier to women owning phones - appointment no-show despite text reminders -message reminders sent too late -low staffing prevented adequate education sessions -messages didn't address varying literacy
Watzlaf et al., 2017	Systematic Research Review (IV)	21	-Overall, privacy was the biggest issue.

The most problematic barrier for implementing telehealth was found to be the lack of technological efficiency. Technology in most rural areas faces inadequacy in internet coverage, equipment and the scale of needed machinery (Bhatt et al., 2018; Dingwall et al., 2015; Duclos et al., 2017; Goodridge & Marciniuk, 2016; Hampshire et al., 2017; Jayasinghe et al., 2016; Kruse et al., 2018; Liu et al., 2019; Sabesan et al., 2018; Schwamm et al., 2017; Sutcliffe et al., 2017; Taylor et al., 2015). In any situation where technology is utilized, the need for education also arises. Education plays into language barriers, understanding the new technology and the deficiency of healthcare workers to provide necessary education (Abejirinde et al., 2018; Dingwall et al., 2015; Driessen et al., 2018; Jacobson & Hooke, 2016; Jayasinghe et al., 2016; Koivunen & Saranto, 2018; Kruse et al., 2018; Liu et al., 2019; Odhiambo & Mars, 2018; Sabesan et al., 2018; Sener et al., 2018; Taylor et al., 2015; Thobias & Kiwanuka, 2018). Further, health systems were sometimes inhospitable to telehealth or lacked sufficient employees to make the process of using the new technology successful (Alaboudi et al., 2016; Bhatt et al., 2018; Driessen et al., 2018; Duclos et al., 2017; Jacobson & Hooke, 2016; Jayasinghe et al., 2016; Liu et al., 2019; McSweeney et al., 2017; Schwamm et al., 2017; Taylor et al., 2015; Thobias & Kiwanuka, 2018). Another major barrier was the potential for a lack of privacy (Duclos et al., 2017; Goodridge & Marciniuk, 2016; Kruse et al., 2018; Schwamm et al., 2017; Sener et al., 2018; Watzlaf et al., 2017). The reality of the absence of financial support in implementation of telehealth has become problematic. The lack of support or resources can affect the efficacy of the program (Alaboudi et al., 2016; Driessen et al., 2018; Hampshire et al., 2017; Koivunen & Saranto, 2018; Liu et al., 2019; McSweeney et al., 2017; Sanchez et al., 2019; Schwamm et al., 2017; Taylor et al., 2015). Finally, the failure to recognize and adjust for cultural differences proved to be a barrier to implementing telehealth

(Abejirinde et al., 2018; Brown et al., 2017; Driessen et al., 2018; Duclos et al., 2017; Koivunen & Saranto, 2018; Kruse et al., 2018; Thobias & Kiwanuka, 2018).

Table 2

Interventions for Barriers of Implementation of Telehealth

Author/Year	Type of Study/level of evidence	Sample Size	Interventions
Abejirinde et al., (2018)	Qualitative study (IV), individualized, focused group	20	-Gradual exposure to Mhealth device. -Talking with a person after using telehealth to process experiences
Bhatt et al., 2018	Quantitative (II)	8,686	-build a low-cost mHealth prototype to collect, store and transmit data -build with smartphone features to transmit images and videos -low cost audible and readable message delivery for poor and rural settings
Brown et al., 2017	Quantitative (II)	18	-Central locations so that patients can incorporate their appointments into their daily routine and do not have to go out of the way. -Positioning the webcam so that the patient is clearly visible as well as the physician. This way they can both read nonverbal cues.
Dingwall et al., 2015	Qualitative Study (IV)	15	-Professionals already focused on alcohol, drugs & mental health -Knowledge known, no deficit -Feasible and acceptable app
Duclos et al., 2017	Qualitative group and semi-structured individual interviews (IV)	187	-assess cultural differences - assess expectations of community -adequate training -adequate encouragement
Hampshire et al., 2017	Qualitative interview and opportunistic sampling. Exploratory study (IV)	34	-provision of equipment and service money -purchase of powerblocks for charging phones
Jacobson & Hooke, 2016	Quantitative Study (II)	12	-Timely resources for troubleshooting -Simulating during clinic visits -Data collection worksheet
Jayasinghe et al., 2016	Qualitative/Quantitative Study (IV)	72	-Improve computer literacy with training -Understanding the culture -Build rapport with the population
Koivunen & Saranto 2018	Systematic research Review (IV)	3000	-Very adaptive program, tools and classes available.
Kruse et al., 2018	Systematic Research Review (IV)	30	-Incentives to use telemedicine such as monetary rewards
Liu et al., 2019	Qualitative individual interviews (IV)	29	-better system for referrals -education of staff and patients about teleophthalmology -educate patients on importance of regular eye screening -create financial incentive for doctors -publicizing the service -reminders for doctor and patient for when next screening due
Odhambo & Mars, 2018	Quantitative convenience sampling survey (III)	92	-simplify informed consent -use creative measures for explaining process of telehealth
Sabesan et al., 2018	Quantitative retrospective descriptive	62	-Combined provider forums -Support from managers and executives

Author/Year	Type of Study/level of evidence	Sample Size	Interventions
	analysis statistics. (IV)		-State funding -common medical information database to reference information -Financial incentive for doctors -A government-endorsed telemedicine practice guide
Sanchez et al., 2019	Systematic research Review (IV)	20	-Chronic illness in school children is common, but treatable with telehealth -Can decrease emergency room visits
Schwamm et al., 2017	Systematic Research Review (IV)	15	-HIPPA requires providers to implement security safeguards when it is provider-to-provider communication. -Mobile connectivity, video compression, smartphones cut the cost of implementation -Mobile devices, smartphones, and distributed medical devices to geographically isolated communities. -In-hospital providers provide direct care from their mobile devices. -Blood pressure monitors connected to smartphones are inexpensive and automatically sent to electronic health records cutting an office visit.
Sener et al., 2018	Quantitative experimental control study (II)	204	-Use of Whatsapp--encrypted and photos can be sent with no other clinical descriptors, but the photos should be immediately deleted. - researchers produced a pamphlet with pictures to demonstrate proper technique for taking photos.
Sutcliffe et al., 2017	Quantitative Study (II)	419	-Mobile phones used as reminders for appointments/test results -Community health worker, an advocate for those who don't have access to a phone
Taylor et al., 2015	Qualitative (II)	105	-Increase education about remote monitoring to create confidence in use
Thobias & Kiwanuka, 2018	Qualitative participatory action approach (IV)	23	-sending messages to community leaders and health workers to remind patients of appointments -patient reminders could be sent to relative/friend -community leaders wielded level of respect in the community to check in on patients who missed appointments
Watzlaf et al., 2017	Systematic research Review (IV)	21	-Peace of mind with trained staff. -Flexibility with privacy is attainable

The most common interventions for the successful implementation of telehealth were overcoming educational barriers by providing opportunities to learn about and how to use telehealth (Abejirinde et al., 2018; Brown et al., 2017; Dingwall et al., 2015; Jacobson & Hooke, 2016; Jayasinghe et al., 2016; Koivunen & Saranto 2018; Kruse et al., 2018; Liu et al., 2019; Odhiambo & Mars, 2018; Sabesan et al., 2018; Sener et al., 2018; Watzlaf et al., 2017). The next most common intervention was overcoming technological barriers with user friendly technology (Bhatt et al., 2018; Brown et al., 2017; Duclos et al., 2017; Hampshire et al., 2017; Jacobson & Hooke, 2016; Schwamm et al., 2017; Sener et al., 2018; Sutcliffe et al., 2017;

Taylor et al., 2015). Interventions for socio-cultural issues focused on considering the location and culture (Abejirinde et al., 2018; Brown et al., 2017; Duclos et al., 2017; Jayasinghe et al., 2016; Liu et al., 2019; Sutcliffe et al., 2017; Thobias & Kiwanuka, 2018). Interventions for financial issues were to make telehealth more affordable (Bhatt et al., 2018; Hampshire et al., 2017; Liu et al., 2019; Sabesan et al., 2018; Schwamm et al., 2017). Lastly there were some identified interventions for privacy barriers, considering HIPPA laws (Jayasinghe et al., 2016; Sabesan et al., 2018; Sener et al., 2018; Watzlaf et al., 2017).

Discussion

The discussion of the results of this study will summarize the main findings. The main findings were grouped into general categories of barriers, and these barriers will be addressed, followed by a summary of the suggested interventions pertaining to that group of barriers.

Technology

Telehealth is centered on the technology that connects patients to health care professionals. However, technology was found to be one of the most prevalent barriers in the implementation of telehealth. The most common barrier in rural areas is an inconsistent cellular network because of the distance between rural and urban areas where the network towers are located (Hampshire et al., 2017; Jayasinghe et al., 2016). Many services in rural areas have a limited range and cannot be scaled to reach a large demographic (Goodridge & Marciniuk, 2016), or have no constant power source to keep it running which leads to unstable network availability (Duclos et al., 2017; Sabesan et al., 2018). Despite these issues, there have been many advances to compensate and overcome the technology barriers, most commonly providing stable access for patients or providers. Lack of consistent cellular network was overcome by

distributing medical devices to geographically isolated communities which would have a direct connection to mobile devices providers used in the hospital (Schwamm et al., 2017).

Even with a reliable network, patients often have no resources to obtain technological devices such as telephones, smartphones, computers or tablets which are needed to access telehealth programs (Dingwall et al., 2015; Schwamm et al., 2017; Sutcliffe et al., 2017). Instead of distribution of specific telehealth devices, simply allowing patients to use personal smartphones that have features to transmit images and videos eliminates any extra technology cost on the part of the patient--making the service more accessible (Bhatt et al., 2018; Schwamm et al., 2017). By downloading the mobile app 'Whatsapp,' patients and providers can have secure HIPAA approved communication (Schwamm et al., 2017; Sener et al., 2018). With patients who have limited electricity, it is essential to provide power blocks for charging phones. This will ensure patients can have a full appointment on this personal phone without the device dying from lack of battery power (Hampshire et al., 2017).

When technology is provided for the patient, it has the potential to wear over time and eventually break, becoming obsolete (Bhatt et al., 2018). When equipment is not used properly or wears out over time, it can often go unnoticed and lead to inaccurate data collection giving false results of the patient's condition and making it more difficult for doctors to access correct patient information (Liu et al., 2019; Taylor et al., 2015). An intervention to make technology more user-friendly and promote patient confidence is to provide adequate and creative training to the patient regarding how to operate the system (Duclos et al., 2017; Odhiambo & Mars, 2018; Taylor et al., 2015). Education should include the proper positioning of the webcam to view both the doctor and the patient--allowing for both parties to read nonverbal cues (Brown et al., 2017).

Many telehealth networks do not have technology support services in place so if equipment breaks or malfunctions there is no trained staff to assist in resolving the problems (Kruse et al., 2018). To overcome any technical barriers, it is essential to have appropriate resources for troubleshooting with specialists on both the provider and patient side to ensure optimal technological performance (Jacobson & Hooke, 2016). Overall, the breakdown or compromise of technology can prohibit doctors and other health care professionals from providing adequate patient care.

Health System

Another common barrier to the implementation of telehealth was the state of the health system in which telehealth is to be implemented. One barrier identified by multiple sources was the lack of an established health infrastructure or established installation program with an initial investment (Driessen et al., 2018; Jayasinghe et al., 2016; Taylor et al., 2015). Due to the lack of structure in many telehealth organizations, some found it difficult to gain the cooperation of nurses and other healthcare professionals often due to a lack of shared vision (Alaboudi et al., 2016; Taylor et al., 2015). An intervention shown to increase employee growth is to offer a financial incentive for staff members. This would allow for the desired amount of staff members to implement telehealth (Liu et al., 2019). Additionally, when beneficial changes to the current systems in place were made, staff and provider both were unwilling to change the original system (Kruse et al., 2018). An intervention that helped the staff was sharing the vision for the company and encouragement of individuals in their roles (Duclos et al., 2017).

With telehealth crossing state boundaries, providers often have an inability to obtain licensure to be able to treat patients at a distance (McSweeney et al., 2017). This was overcome by stable technology using HIPPA secure apps that patients can access on their smartphones

(Sener et al., 2018). Another issue for providers is the amount of time that is taken out of their busy schedule in order to properly assess and consider a patient's case via telehealth (Bhatt et al., 2018). This barrier could be overcome with adequate staffing allowing each doctor to have less patients (Liu et al., 2019).

It is common for providers new to telehealth to make treatment decisions based on inaccurate patient data, or to be competing with local physician for patients. (Liu et al., 2019; Schwamm et al., 2017). Other medical professionals working with telehealth have concerns about message reminders for appointments being sent too late, low staffing preventing adequate education sessions and the increasing workload (Duclos et al., 2017; Thobias & Kiwanuka, 2018). An intervention to both of these problems with the health system would be having provider forums where providers can share and collaborate on topics. Such collaboration could increase doctor productivity and satisfaction (Sabesan et al., 2018).

Education

Telehealth focuses on bringing technology in many forms to the fingertips of people around the globe. However, this constant change can leave communities without proper education. The most common educational barriers were the lack of translation into the community's native language and the baseline level of education and literacy. Most patients in rural areas, deal with a lack of education. This results in a decreased literacy level and potential for misunderstandings with physical education (Driessen et al., 2017; Jayasinghe et al., 2016; Liu et al., 2019). No amount of education will ever do any good for the patients, if it is not correctly translated into the language of the user (Dingwall et al., 2015; Odhiambo & Mars, 2018). However, many groups have overcome this hurdle with the use of adequate training and classes to better understand the patients. With the added education of teaching reading and

writing to patients, as well as, educating the staff on a new language, education can thrive (Jayasinghe et al., 2016; Koivunen & Saranto 2018).

Another issue is the overuse of text on apps, rather than informative pictures. Visual learning is the first step for most patients, especially when dealing with a language barrier. This ties into the lack of computer literacy. Computer literacy includes not understanding technology, forgetting how to call the provider and not understanding how to take pictures of oneself (Dingwall et al., 2015; Jacobson & Hooke, 2016; Jayasinghe et al., 2016; Koivunen & Saranto, 2018; Kruse et al., 2018; Sener et al., 2018; Thobias & Kiwanuka, 2018). Computer literacy ties into education level. If the patient does not understand the computer or phone application, then the health care team can be of no service. However, many programs created classes to educate on how to use the technology given to patients. This education included the patients and the staff. Photos were used in apps and pamphlets to help with the bridge to literacy. The staff also had the patient demonstrate what they had learned to confirm understanding of the technology (Jacobson & Hooke, 2016; Sener et al., 2018; Watzlaf et al., 2017).

Finally, a major barrier to implementation of telehealth is the lack of training and education of employees. Lack of education was found to result in the limited use of new equipment, the deficiency of successful policy implementation, and the inability of staff to successfully educate patients about telehealth. With these problems came an increased employee turnover and a decrease in the education of the new staff (Jayasinghe et al., 2016; Liu et al., 2019; Sabesan et al., 2018; Taylor et al., 2015). To address this lack of staff education, many programs have created classes after hours for nurses and doctors to better understand the use of telehealth. The use of worksheets, logs, and demonstration allows for better retention of

staff and exceedingly improved patient outcomes (Liu et al., 2019; Roosmalen & DeBrouwere, 2018; Watzlaf et al., 2017). Another way to promote further education of telehealth is an incentive program that will give monetary rewards to employees to implement and educate on telehealth (Kruse et al., 2018).

Financial

In addition to the educational barriers to telehealth, other barriers exist in the realm of finances. Telehealth needs financial support to be viable, so financial factors can act as a barrier to telehealth in many different situations. For instance, many have run into the issue of inadequate funding to begin the project as well as a funding source to keep the service sustainable (Alaboudi et al., 2016; Koivunen & Saranto, 2018). A way to overcome inadequate funding is the provision of equipment and service money as well as state funding (Hampshire et al., 2017; Sabesan et al., 2018). Additionally, the cost to maintain equipment can diminish success of telehealth, as many places cannot afford the cost of servicing or replacing parts of expensive pieces of technology (Driessen et al., 2018). To address this, there is a low-cost mHealth prototype that has been built to collect, store and transmit data (Bhatt et al., 2018). There is also a low cost audible and readable message delivery system for poor and rural settings (Bhatt et al., 2018). To make the process of telehealth more affordable the use of mobile connectivity, video compression, and smartphones cuts the cost of implementation (Schwamm et al., 2017). Also the ability to automatically transmit readings from blood pressure monitors connected to smartphones has aided in lessening office visits and cutting costs (Schwamm et al., 2017).

Another barrier that prevents implementation is the financial burden of service falling on the health care provider, along with a lack of reimbursement (Hampshire et al., 2017;

McSweeney et al., 2017). A way to prevent the financial burden falling on the health care provider is to create a financial incentive for doctors (Liu et al., 2019; Sabesan et al., 2018). Others found that some insurance plans do not cover some particular telehealth services, such as teleophthalmology, which can place financial strain on the patient (Liu et al., 2019). There may be an absence of program funds creating an unstable program (McSweeney et al., 2017). To address the absence of program funds would be state funding (Hampshire et al., 2017; Sabesan et al., 2018). The last barrier is the lack of finances to support telehealth education for nurses, schools and training programs (Taylor et al., 2015). There was no intervention to address this issue found in the literature.

Privacy

Another major theme of barriers was that of privacy. With the implementation of telehealth, privacy has become one of the barriers to consider since it is a legal and ethical issue (Goodridge & Marciniuk, 2016; Sener et al., 2018). This concern is not limited to the United States, as privacy seems to be one of the biggest concerns in developing countries as well (Goodridge & Marciniuk, 2016; Kruse et al., 2018). The first thing to consider is the legal system of the country in which telehealth is being implemented, as different countries have unique standards of privacy to use as a baseline for a telehealth program (Jayasinghe et al., 2016). As for barriers involving patients, some expressed specific concern at the idea of their information floating around in a network (Duclos et al., 2017). The modes of transferring, storing, and sharing of patient information are the areas of privacy where patients are most concerned (Goodridge & Marciniuk, 2016). Building rapport with the population will help them trust that the health workers will keep their information private (Jayasinghe et al., 2016).

While building rapport with the patient, it is essential to educate them on the privacy policies of telehealth, and providing education in the patient's native language can help eliminate the barrier (Watzlaf et al., 2017). Further, ensuring a thorough education of providers about the policies and procedures can also contribute to keeping the patient information private (Watzlaf et al., 2017).

One way that a privacy breach can occur is because of an unsecured system that allows the information to be available to third parties (Duclos et al., 2017; Kruse et al., 2018). On a large scale, the creation of a government-endorsed guide to telehealth practice would also help to create a continuity of privacy standards to ensure security for the patients (Sabesan et al., 2018). For example, a current standard to be acknowledged is the Health Information Technology for Economic and Clinical Health Act (HITECH). The HITECH Act was written in 2010 to strengthen the Health Insurance Portability and Accountability Act (HIPPA) in regards to technology in a health setting (Watzlaf et al., 2017). On a smaller scale, one particular platform for preserving the security of information is WhatsApp--a cellular application that can encrypt photos and messages while maintaining the quality of any images that need to be shared with providers (Sener et al., 2018). Another small adjustment to provide privacy is to refrain from sending patient identifiers with any photos, and by deleting them after viewing them (Sener et al., 2018). When dealing with a program, it is necessary to have some Business Associate Agreements (BAA) to keep the business accountable in keeping the patient's information private (Watzlaf et al., 2017). Regardless of what a patient's particular concern may be, patients who do not understand the privacy component of telehealth are likely to be reluctant to use the service (Kruse et al., 2018).

Socio-Cultural

Another prevalent barrier recognized in the research was that of socio-cultural considerations. At a very basic level of cultural consideration, location must be considered. In the research, some found that an inconvenient location for a telehealth session may deter clients from using the service (Brown et al., 2017). In order to address this issue, it is suggested that telehealth calls be based at centralized locations that allow patients to incorporate their appointments into their daily routine and not have to go out of the way (Brown et al., 2017).

As for barriers involving the public's view of telehealth, it was found that many patients had a fearful initial reaction to the device used for telehealth (Abejirinde et al., 2018), while others reported that the patients perceived healthcare via a telephone to be impersonal (Koivunen & Saranto, 2018). A simple intervention for this barrier was to allow patients to be gradually exposed to a new telehealth device in order to decrease fear of, or discomfort with the mechanism to providing telehealth service (Abejirinde et al., 2018).

In addition to barriers to telehealth that stem from normal daily life, one survey of hospital directors found that participants commonly viewed cultural considerations to be a barrier to telehealth (Driessen et al., 2018). Further, others found that a language barrier could prevent the successful use of telehealth (Kruse et al., 2018). The suggested remedy to this issue requires implementers of telehealth to take the time to assess the cultural differences and the expectations of the community in order to implement telehealth successfully (Duclos et al., 2017).

Some studies cited very specific cultural barriers. For instance, one study where telehealth was used to simply remind women to attend their doctor's appointments found that a major barrier to the success of this service was simply women failing to attend their

appointments despite text reminders (Thobias & Kiwanuka, 2018). In response to their own discovered issue, the study suggested sending message reminders to community leaders and health workers in order to help them remind patients of their upcoming appointments--though this should be noted as a very culturally sensitive issue and intervention due to cultural privacy considerations (Thobias & Kiwanuka, 2018).

Finally, and perhaps most surprisingly, two separate articles confirmed that a major barrier to the use of telehealth for women in a rural African community was the cultural belief that a wife's access to or ownership of a cell phone was simply an open door to infidelity--reported both in Tanzania (Thobias & Kiwanuka, 2018) and in Burkina Faso (Duclos et al., 2017). In response to this issue, one of the articles suggested that this issue of the lack of a cell phone could be remedied by contacting a family member or friend that a woman designated to receive her message reminders for her instead--though again, this is an extremely culturally-specific intervention (Thobias & Kiwanuka, 2018).

Implications

The results of this study have potential helpful implications for the use of telehealth in the health system. By recognizing barriers to implementing telehealth and the possible solutions to those barriers, the healthcare community has the ability to move forward in the provision of care to rural communities via telehealth. However, this potential may never be realized until important considerations for education, practice, and future research are acted upon.

Education & Community Education

In order to reach the potential for the successful use of telehealth, education of both patients and providers will prove essential. By providing patients with thorough and culturally

competent information about the technical, situational, and medical implications of the telehealth service, patients may feel more at ease with the technology and more likely to incorporate it into their daily lives--thereby increasing their consistent access to care. Further, by educating providers on the service, they will be able to offer an explanation to their patients. In a sense of more general education about telehealth, exposure to this healthcare medium and its common pitfalls at universities and hospitals may allow for nurses and providers to incorporate it into the groundwork of their practice to create smoother transitions and more consistent availability of care. Encouraging education on multiple levels, will create a stronger understanding for the implementation of telehealth.

Practice

Nursing practice would be affected by the implementation of telehealth giving the opportunity to monitor patients from their homes, reducing office visits. It also has the potential to benefit the patients as they are able to monitor their chronic illness from their own home and have the ability to contact a telehealth doctor or nurse when in need of help. Implementing telehealth in rural populations, which often lack accessible health services, could positively increase patients' health and well-being and increase positive outcomes for the underserved populations.

Future Research

Future research implications recognized by this study include the need for more studies testing telehealth interventions. Most studies focused on barriers and perceptions of telehealth, and the interventions that were listed were primarily theoretical. Additionally, it would be ideal to have more evidence-based practice by creating more studies that test the accuracy of patient diagnosis via telehealth--an important study for ensuring quality patient care. Finally, while

there were studies about the perceptions of telehealth and the interface, creating studies that compare the usability and perceptions of particular designs of telehealth interfaces could enhance the successful use of and positive reactions to telehealth.

Strength & Limitations

There are several strengths and limitations of this study that need to be addressed. The strengths included the use of a mentor who has research experience, the researchers' interest in the study, and the large amounts of literature available. The limitations included time constraints due to other obligations and classes coinciding with research time, inability to access all databases and fees associated with certain journals. Inexperience of the researchers was also a limitation for this study. Another limitation was that some of the available research was older than five years. Due to the limitation of databases this could have introduced a sample bias.

Recommendations

Recommendations for replication of this study would be to include more time to research the topic, more inclusive search engines, other research resources to obtain newer studies, observing telemedicine firsthand, and better time management to complete research within a condensed time frame. No clinical guidelines were found when researching the application of telehealth. Telehealth crosses state and national boundaries so would benefit from the establishment of standardized health policies.

Conclusion

This systematic review was conducted using current literature to identify the barriers to the implementation of telehealth in rural areas and nursing interventions to overcome those barriers. The review explored evidence that technology, health systems, education, financial, privacy, and socio-cultural challenges were the top six categories of barriers when

implementing telehealth. Interventions focused on creating a sustainable network and proper education of patients and healthcare professionals. Identification of barriers and interventions to overcome barriers are crucial for the development of long lasting, functional telehealth systems that will serve the underserved rural populations. Telehealth has the potential to make a monumental difference in the mental, physical and spiritual care of patients who need medical attention in rural areas.

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