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Telemedicine and Healthcare Implications for Central Virginia: A Systematic Review of the Literature

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Keywords

Telehealth, education, technology training, rural, remote populations

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Abstract

Background: Uncertainties and challenges associated with COVID-19 have hampered the efficient delivery of health care in Central Virginia. Integrating and redesigning health systems could boost the quality and efficiency of care delivery. Telemedicine has been suggested as a viable solution to increase virtual access to patient advocacy healthcare education and training programs. It has the potential to help facilitate the delivery of health services to rural and remote areas. Access to quality telehealth services is projected to minimize the need for in-person hospital visitation amid the pandemic. The innovation also facilitates remote assessment of patients and monitoring of patient illness and treatment. For the rural population at risk of COVID-19 or any easily transmissible infection, telemedicine can provide convenient access to routine care without provider-patient contact and limit the spread of the virus.

Methods: A systematic literature review of peer-reviewed and grey literature was conducted. The authors used electronic databases, including Embase, PubMed, CINAHIL, and Web of Science, to locate and access relevant articles based on their inclusion criteria. Studies were selected that investigated the implementation of telemedicine in the clinical and educational healthcare settings in rural or remote locations within the United States. Forty articles were identified for review. The identified articles published between 2010 and 2021 were used in the study.

Results: There was no significant literature on telemedicine utilization in the Commonwealth of Virginia. Additionally, limited studies on rural and remote settings utilized telehealth services during the COVID-19 pandemic. Nevertheless, evidence suggests that telemedicine could improve access to healthcare services and enable providers to monitor patients from a distance. Researchers identified six critical factors associated with telemedicine's success and

sustainability: education, training, vision, ownership, adaptability, economics, efficiency, and equipment.

Conclusions: Rural and remote communities experience healthcare disparities and poor patient outcomes due to limited access to quality care and inequalities in education, training, and resource allocation. A deficiency of technological skills, knowledge, and or resistance to change may prevent a quality telehealth program from being able to serve patients adequately.

Introduction

As McElroy, Day, and Becevic (2020) reported, the COVID-19 pandemic and associated healthcare impacts created the need to support virtual health and allow a more robust implementation of telemedicine services. During the pandemic, technological advances guaranteed adherence to government mandatory social distancing appeals and accelerated the implementation of telemedicine. Telemedicine increases virtual access to healthcare services and minimizes the need for in-person hospital visitation amid the current COVID-19 pandemic. The Department of Medical Assistance Services (2020) (DMAS) defines telemedicine as a service that permits real-time two-way communication and data transfer between patients and physicians for health assessment and treatment. According to Edirippulige and Armfield (2017) availability of appropriate systematic education and training for healthcare providers and medical staff members has been emphasized as being necessary for effective adoption. However, the availability and nature of telehealth-related education and training for healthcare providers and medical staff are not being directly addressed. By reviewing the literature, this study has aimed to describe the delivery of education and training in telehealth, with a lens on content and modes of instructional delivery. Telemedicine and telehealth concepts have, in the past, been used interchangeably, though they vary in scope and focus. Telehealth uses information technology (IT) to support clinical health services, patient and professional health-related education, public health, and health administration across distances (DMAS, 2020). Thus, telehealth has a broader scope than telemedicine. Additionally, it focuses on technologies that support telemedicine, such as smartphones, videoconferencing, streaming media, store-and-forward imaging, and remote patient monitoring devices.

Uncertainties and challenges associated with COVID-19 have hampered the efficient delivery of health care in Central Virginia. Integrating and redesigning health systems can increase the quality and efficiency of care delivery in the region. McElroy, Day, and Becevic (2020) found that telemedicine can increase access to quality, affordable care with minimal in-person visits to health settings, hence boosting patient and provider safety. Kruse, Bouffard, Dougherty, and Parro (2016) found that telemedicine implementation in Native American Communities resulted in a 59% increase in access to health care providers in and outside of the immediate service area and saved $36 billion in health costs annually. Telemedicine allows community health providers in Central Virginia to understand people's health needs at the community level and identify potential disparities that could hinder equal coverage and care delivery. According to the Virginia Department of Medical Assistant Services (DMAS), reimbursement occurs subject to coverage requirements (DMAS, 2019). Specific telemedicine services in Virginia rural areas include psychotherapy and counseling, health assessment and management, obstetric ultrasound procedures, diabetic retinopathy screening, and radiology services. As Lee, Karsten, and Roberts (2020) have asserted, Virginia has introduced laws to join the Interstate Medical Licensure Compact (IMLC), making it easier for out-of-state telemedicine providers to practice in the state. Therefore, providers do not have to acquire separate licenses to provide telemedicine services in Virginia.

Technology, mobile applications, and internet infrastructures are critical in supporting telemedicine in Central Virginia. According to Kruse, Bouffard, Doughert, and Parro (2016), only 10% of Native American communities have access to the internet. In addition, heavy regulatory laws and a lack of parity laws present barriers to equal coverage and billing for telemedicine services. Virginia has put in place crucial legal and policy frameworks for the success of telemedicine. The state's parity laws mandate reimbursement for telemedicine services from Medicaid and private payors (DMAS, 2019). This article examines the scope and scale of telemedicine services in Central Virginia, their utilization during the covid-19 pandemic, and future expectations post-pandemic.

Virginia's demographic shift

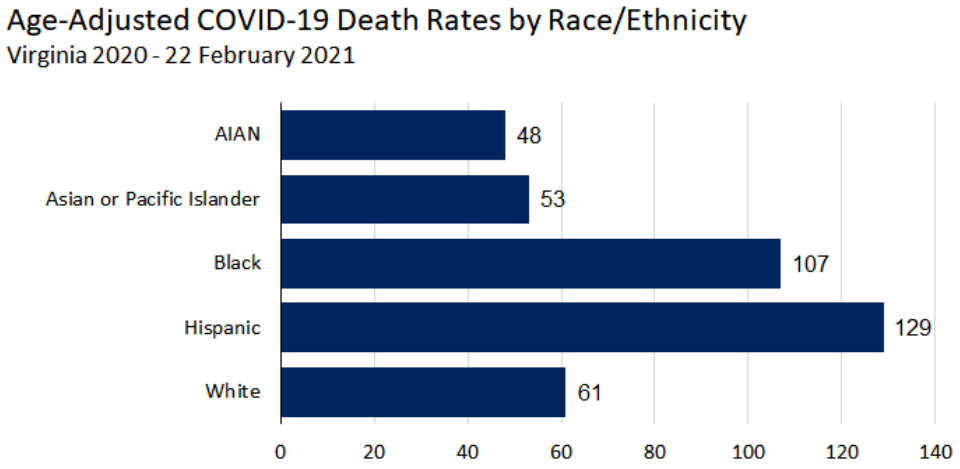
The Virginia Department of Health (VDH) cites a lack of data on race and ethnicity as a significant challenge in achieving equality in healthcare delivery (VDH, 2020). The Virginia

population is diverse, and the demographic of non-natives continues to expand due to migration into the state. Therefore, VDH (2020) encourages health providers to capture data on patients' race and ethnicity to support essential functions of the Virginia health system. VDH (2020) combines race and ethnicity information into one category, but racial identities have grown from three to seven. Previously, VDH (2020) reported race data as one of three categories: White, Black or African American, and Other. In addition, ethnicity data helped identify the Hispanic or Latino populations and Non-Hispanic or Non-Latinos. The demographic shift is likely to affect health care delivery, given the disproportionate burden of health problems faced by minority populations (Fremong & Lurie, 2006). As Crawford and Serhal (2020) asserted, the information is critical in reducing disparities in quality care across the Commonwealth of Virginia and other states. The VDH (2020) research shows that COVID-19 disproportionately affected Virginia's Black and Hispanic populations. As VDH (2020) discussed, racial and ethnic health disparities illuminate areas where significant health and disease inequity exists. Unfortunately, these disparities occur significantly in Virginia and the nation. This evidence of racial disparity concerning health is no different from crucial measures of the COVID-19 pandemic. Life expectancy in the United States is estimated to be reduced at least three times more for Hispanic and Black populations than for White populations due to COVID-19, decreasing ten years of progress in bridging the life expectancy gap between White and Black Americans. However, opportunities exist as significant data are being collected regarding resources directed to addressing COVID-19 and its complications. By recognizing these disparities and prioritizing strategies to address them, overall population health and that of the most at-risk subpopulations can be improved.

The VDH (2021) has suggested that age-adjusted rates are another approach that should be considered in comparing COVID-19 data. When compared to the White rate, VDH (2021) has reported that the Hispanic age-adjusted COVID-19 death rate was 2.1 times higher; the Black rate was 1.8 times higher; the Asian rate was 0.9 times that of the White rate, and the American Indian/Alaska Native rate was 0.8 times that of the White rate. The disparities in death rates were significantly earlier in the pandemic and decreased over time. Compared to the White rate, the Hispanic age-adjusted death rate was 3.5 times higher, the Black rate was 1.9 times higher, and the Asian rate was 1.8 times higher. In general, compared to the White population, all other

racial and ethnic groups' age-adjusted death rates improved during the pandemic prior to the COVID-19 vaccination being introduced (VDH, 2021). Hispanic to White population comparisons illustrate this most clearly. Compared to the White rate, the Hispanic rate was 3.5 times higher, then 3.1 times higher, then 2.4 times higher, and then 2.1 times higher (VDH, 2021).

Table 1



Deaths per 100,000 population, age adjusted to 2000 U.S. Standard Population;
Population data 2019 NCHS bridged race and ethnicity;
175 deaths race not report; 52 other race; 30 two or more races; 14 no age provided

Source: Virginia Department of Health (2021)

The lack of race and ethnicity data may expand the current disparities in health by limiting the accessibility of telemedicine services to the majority and a few minority populations. For example, in Pennsylvania, Eberly, Kallan, Julien, Haynes, Khatana, Nathan, Snider, Chokshi, Eneanya, Takvorian, et al. (2020) found that socioeconomic status, race, ethnicity, and language barrier were associated with low use of telemedicine services. In addition, community and cultural beliefs relative to the benefits and harms of virtual health are likely to affect telemedicine use (American Medical Association, 2020; Kruse, Bouffard, Dougherty & Parro, 2016). Therefore, as Mann, Chen, Chunara, Testa, and Nov (2020) discussed, provider-driven efforts to collect accurate demographic data are an essential step toward minimizing explicit and implicit bias and other disparities in healthcare delivery. The move supports telemedicine in

implementation in Central Virginia and enables practitioners working at the community level to identify inequities and propose appropriate solutions to achieve equity in care delivery.

Telemedicine in Remote and Rural Regions

Integration and technical support regarding technology training education pose a challenge to the implementation of telemedicine in remote and rural regions. Mehrotra, Jena, Busch, Souza, Uscher-Pines, and Landon (2016) examined trends in the use of telemedicine from 2004 to 2013 across twenty-nine states. Laws in the investigated states required Medicaid and private insurers to reimburse users and providers using telemedicine services. The study found that only 1% of Medicare beneficiaries had access to telemedicine services due to a lack of integration and knowledge of telehealth technology. Evidence suggested the need for providers to evaluate telemedicine governance critically. Legal and regulatory restrictions limiting the accessibility of telemedicine services based on coverage and location should be addressed. Mehrotra et al. (2016) emphasized the importance of establishing a mechanism that improves collaboration between health departments and other stakeholders in telemedicine provision and coverage. Streaming policy across health departments in Central Virginia facilitates the integration of technical services, support systems, and providers in telemedicine implementation. Telemedicine has the potential to provide professional, sound, and reliable ways to enhance the efficiency of the health system in Central Virginia. The innovation enables Central Virginia physicians to conduct virtual patient assessments, track illness symptoms, and manage health information remotely without physical presence. Based on the findings of Bashshur, Howell, Krupinski, Harms, Bashshur, and Doarn (2016). telemedicine reduces readmissions to hospitals, which is necessary amid the pandemic. Physicians can monitor patient symptoms and medical treatment and initiate a rapid response to emergencies.

Telemedicine decreases resource disparities between rural and urban settings by elevating access to health services. Singh, Mathiassen, Stachura, and Astapova (2010) examined resource distribution relative to healthcare from different perspectives. The researchers reviewed past studies that focused on the impact of telemedicine in the most significant public health district in Georgia from 1988 to 2008. Whereas rural areas accounted for 20% of the country's population, only 11% of the county's physicians were allocated to the areas, reflecting an imbalance in resource allocation. Singh, Mathiassen, Stachura, and Astapova (2010) suggested a more robust

telemedicine implementation to enhance balance in resource allocation in rural and urban regions. Telemedicine offers an alternative to traditional health systems and increases access to medical services in underserved communities. It is a means to the end goal of affordable care supported by cross-sector partnerships and adequate public health funding.

Telemedicine has multiple benefits to rural health, such as providing medical services over vast distances and facilitating knowledge-sharing between providers and patients. Flodgren, Rachas, Farmer, Inzitari, and Shepperd (2015) also enhance collaboration in multifaceted decision-making and diagnostic processes across healthcare institutions. As McElroy, Day, and Becevic (2020) suggested, telemedicine has facilitated the management of chronic diseases, heart failure, and blood glucose regulation in patients with diabetes. Integrating telemedicine, technical services, and support systems can increase acceptability in the rural population.

Gaps in telemedicine implementation

Evidence suggests the importance of telemedicine in navigating mobility and efficiency challenges during the pandemic**.** The Centers for Disease Control (CDC) (2020) and the World Health Organization (WHO) upheld telemedicine as a viable alternative to direct patient healthcare. Digital health, including robotics, provides an opportunity to remotely monitor COVID patients, deliver medical treatment and disinfect wards while limiting physical provider-patient contact. However, research on telemedicine accessibility and its utilization in rural areas of the United States, mainly rural Central Virginia, is scanty. Lawler (2015) states that not every patient utilizes telemedicine services even though its benefits can be realized across populations. Literature highlights the influence of demographic data and cultural beliefs in using and integrating telemedicine in health systems. Substantial evidence is required to examine current trends in utilization, barriers, and the impact of telemedicine in Central Virginia. Telemedicine research supports evidence-based policy development decisions toward current telemedicine implementation gaps. This study analyzes past research on telemedicine utilization in rural Central Virginia and highlights the sustainability and success of the services in the areas.

Materials and methods

A qualitative study and a systematic review of telemedicine literature were performed. The review protocol is registered and confines the PRISMA checklist for suitable reporting items in systematic reviews.

Search strategy

The search strategy was a multiple-step process. First, search terms "rural," Central Virginia," "telehealth," "telemedicine," "video consultation," and "COVID-19" were applied to databases such as Embase, PubMed, CINAHIL, and Web of Science to locate and access peer-reviewed studies relevant to the study. Next, multiple search terms were combined to form phrases used to expand the search scope and retrieve additional data sources. Next, the preliminary examination of texts and content in titles and abstracts was performed. The index words utilized to categorize the study allowed the final search phrases to develop. The search was conducted in February 2021. The new terms were entered into the databases and Boolean operators' OR' and 'AND' helped locate relevant studies. Finally, the snowballing technique was applied to highlight other suitable studies in the reference lists of the retrieved studies.

The primary findings of this study were the lack of type, features, and number of telemedicine services recorded in rural and remote regions. The characteristics of desired services included the patients, the goal of the service, location, and clinical aspects. Secondary findings of interest to this study were (1) essential insights or findings associated with the sustainability and effectiveness of services; (2) methods applied to examine the services; (3) the measurement of the outcomes; (4) utilization of resources and costs; (5) best practices in telehealth technology usage training and patient acceptance; and (6) process evaluation and measures.

Screening and Appraisal

The abstracts and titles were screened independently. In case of any doubts, the study remained on the list for examination by a third party. At the text screening stage, a reviewer with expertise in telemedicine implementation in rural areas reviewed texts for each study and gave feedback based on the inclusion and exclusion criteria. All studies that met the inclusion criteria were considered for analysis. Data extraction was systematically guided by a pre-determined list of questions and variables. The data was recorded in a database created for this research. The process was tested on five articles and revised, and data on the following parameters were captured.

- The year of publication; author; the purpose of the article.

- Geographical setting; remote; rural; or included a region in the Commonwealth of Virginia.
- Service details; clinicians; purpose; the form of telehealth used; target clinicians
- Methodological approach; study design; source of data
- Recorded outcomes; costs; utilization of resources; facilitators of effectiveness; satisfaction, and process measures
- Other outcomes, including examples of evidence, identified variables determining sustainability

A second reviewer performed independent data extraction for a random selection of eight articles. The findings of the data extraction by both researchers were scrutinized for accuracy, consensus, and completeness. The shortcomings were resolved through mutual discussions. The quality of each study was also examined utilizing an adjusted tool created for a systematic examination of primary healthcare services in remote regions and rural areas. The quality criteria were appropriate because they covered a scope of features relating to the services and methodology applied. Hence, it was adequate for the objective of the analysis.

Synthesis Stage

The data was grouped according to discipline, clinical specialty, service details, and geographical location. By utilizing the inductive approach, the extracted data is related to sustainability. The effectiveness of services was categorized according to themes to highlight the recurring features regarding the research questions. Finally, the data were synthesized to become a narrative account that summarized the evidence by comparing and contrasting the data.

Table 1. Showing the inclusion and the exclusion criteria used within the study

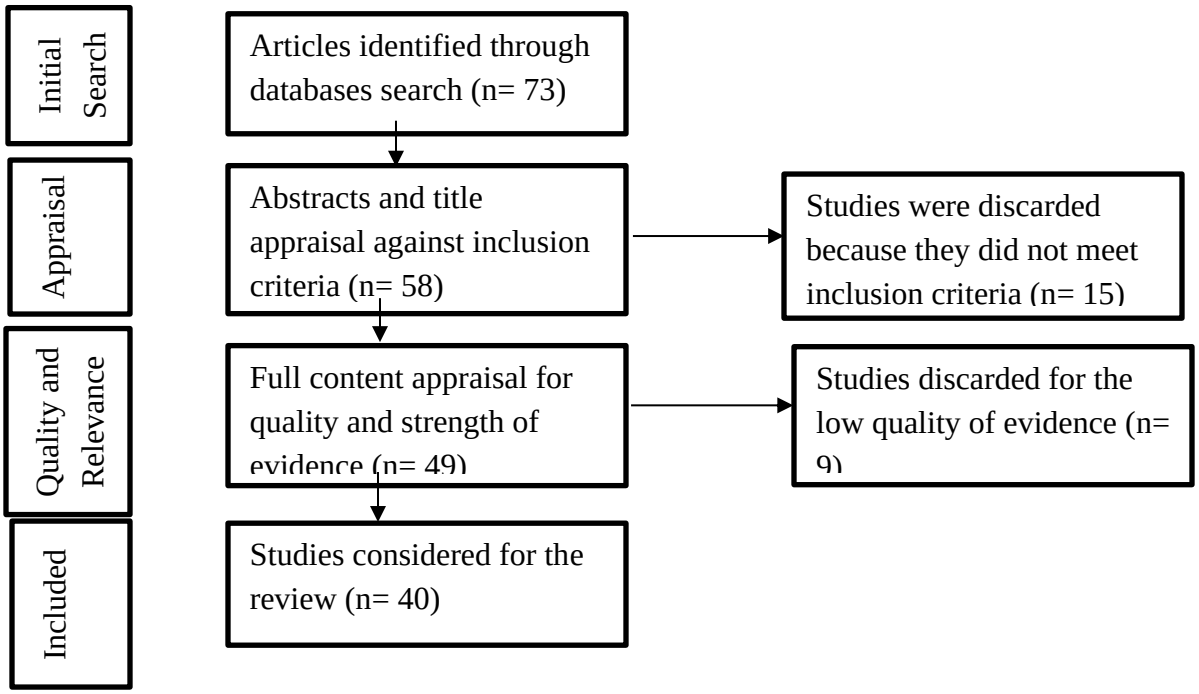
Criteria	Inclusion Criteria	Exclusion Criteria
Period	2010 to 2021	Articles published before 2010 and after 2021
Language	English	Languages that did not include English (translated or written in another language)
Place of study	Rural, remote, and or Commonwealth of Virginia (Central Virginia), and other areas in the United States	Areas outside of the United States
Aspect of healthcare	All healthcare levels, including tertiary, secondary, and primary healthcare.	Studies focus on other health aspects, not on the inclusion criteria
Geographical delimitation	Rural and remote area	Developed towns and cities
Type of technology services	All available technological services are used in delivering telehealth services within the specific area of study.	• Telephone-only service. • Technology is primarily used for administrative purposes • Pilot studies
Study design	All study designs included case studies, reviews, and qualitative and quantitative studies.	Studies that do not intend to offer telehealth/telemedicine services

Results and Discussion

Selection of Articles

The searches identified seventy-three potentially eligible articles. The excluded articles did not match the inclusion criteria for reporting telehealth services in rural or remote regions of the Commonwealth of Virginia or other areas within the United States. In addition, studies used to pilot or feasibility studies that were not meant as telehealth services were also excluded. A total of 40 articles published between 2010 and 2021 out of the original 73 were used in the review.

Table 2. The search process



Discussions

No studies specifically focused on telemedicine use during the COVID-19 pandemic in the Commonwealth of Virginia. There was also limited data on the region's specific challenges with telemedicine provision and supporting systems. As healthcare organization expands, the main objective should be to meet the demands of the consumers. Major healthcare organizations are primarily located in the Commonwealth of Virginia metropolitan "urban" areas. Literature draws attention to health inequities among rural populations in Virginia. The use of telemedicine can provide a platform on which providers and other health stakeholders can address gaps in the healthcare industry, including healthcare inefficiency and poor patient outcomes. This should be conducted to shape policy and decision-making that promote health equity in the Commonwealth of Virginia. Evidence suggests that some patients can remain unattended in extreme cases, resulting in poor patient outcomes. Shortage of providers and patient dissatisfaction present severe threats to the success of telemedicine.

Virginia's decision to join the Interstate Medical Licensure Compact addresses this concern by providing an expedited pathway to professional licensure for out-of-state providers to practice in the state.

In addition, patient dissatisfaction can be addressed through integration and proactive public awareness of the benefits of telemedicine during the pandemic.

Conclusion

Telehealth and or Telemedicine have the potential to address many vital challenges related to health and healthcare delivery in rural Central Virginia. This region has a diverse and widely spread population, primarily located in remote and rural areas. The analysis identified the challenges and a range of health services offered through telemedicine in the region. Telemedicine improves Virginia's health system's potential to provide healthcare services and monitor patients at a distance and remotely. Moreover, telemedicine improves healthcare outcomes and significantly reduces health costs, contributing to affordable care achievement.

Recommendations

Telemedicine to Improve Patient Outcomes in Rural Central Virginia

According to McElroy, Day, and Becevic (2020), the disruption to in-service patient care caused by the COVID-19 pandemic has brought about the need for quality telehealth. Providing telehealth patient care to more rural areas in Central Virginia will have wide-ranging impacts on the service models of medical providers. Before the pandemic, telehealth adoption was limited to even the most basic health and medical services. The Virginia Department of Medical Assistance Services (2020) reported that total claims for eligible services remained below one percent of commercial and Medicare office visits in 2018-2019. However, according to the Virginia Department of Medical Assistance Services (2020), the onset of the COVID-19 pandemic catalyzed telehealth by shaping four forces—1) patient education and training, 2) education and training of medical practitioners and staff, 3) patient acceptance, 4) cultural humility, 5) healthcare provider acceptance, and 6) reimbursement policies, which have greatly accelerated its adoption.

As studied through the review of the literature, it is believed that the key actions rural and remote healthcare providers should consider taking in Central Virginia include:

- Educational health technology training opportunities are needed to assist in learning the basics of telehealth. Edirippulige and Armfield (2017) reported that staff members with limited experience using telehealth delivery methods might benefit from an introductory training course. Trainees may learn the basics of telehealth technology and equipment,

compliance and regulations, reimbursement, and how to establish a telehealth workflow. Additionally, ongoing training in virtual patient health service delivery may enhance the skillsets of those already familiar with telehealth.

- Gathering information from a patient during an in-person office visit may allow for auditory and visual cues that may be more difficult to identify through a virtual telehealth session. Digital communication training can assist health providers, and other staff learns effective means of interviewing and examining patients in a virtual setting.
- Healthcare providers and medical staff members need to recognize the distinctive elements of each patient and their identity to give them the best telehealth care possible. Cultural humility training counteracts the stigma and misinformation that may surround traditionally underserved communities. Understanding the complexity of each patient and their daily life, the healthcare provider and the medical staff members can help support them in the best way that may be suited to their needs.
- Telehealth has primarily followed a one-size-fits-all model, which has led to disparate adoption across geographies and socioeconomic lines. By assessing the following factors, medical providers will be able to better tailor marketing and offerings and expand patient catchment beyond current geographies to help maintain relationships with a preferred medical provider.
- As the United States Department of Health and Human Services (2020) (USDHH) reports, telehealth can assist providers in filling operational gaps, alleviating staffing burdens, increasing patient access through education, and modernizing care-delivery channels. Defining organizational goals and deficit areas will help identify the telehealth solutions that will work effectively for their medical practice and service region.
- According to VDH (2020), providers were forced to transition to telehealth services at the beginning and during the pandemic as in-person visits and procedures were postponed. As discussed by Smith, Thomas Snoswell, Haydon, Mehrotra, Clemensen, and Caffery (2020). The focus was on how to promptly transition rather than taking the time to formally integrate telehealth into clinical workflows for patients by their medical providers. At this time, providers must evaluate how to redesign operating models to incorporate and prioritize telehealth for all their patients in the most efficient manner.

- The Centers for Disease Control (2020) reported that unemployment regulations, vaccine mandates, an aging or retiring workforce, and general burnout amid mental and physical health concerns during the pandemic have led to a nationwide shortage of medical practitioners. The VDH (2020) predicts a deficit of primary-care and specialty physicians by 2033. Telehealth can be a source of relief for providers as they continue to work through staffing shortages and increasing salary expectations and wages, which make up more than half of hospital operating expenses, on average.

Implications of the Study

An analysis of the current literature reviewed the correlation between the utilization of telehealth and the percentage of the population that lives in rural and remote areas. The data showed a negative correlation, suggesting that, in general, telehealth has a lower adoption rate in rural areas. Several factors may explain this, such as an older and lower socioeconomic population in rural areas being less predisposed to learning new technology and having a greater prevalence of behavioral health challenges that have caused a reluctance to use telehealth services. This study highlighted the specific issues facing the implementation of telemedicine in Central Virginia. These issues included limited research on telemedicine utilization in the region, lack of demographic data, and challenges in integrating users, provider services, and support systems. In earlier research discussed by Conde, Suvranu De, Hall, Dwight, and Peng (2010) and Edirippulige and Armfield (2017), education and training in telehealth is necessary at the university level and through vocational courses, which use traditional classroom-based delivery methods and distance education. Although, according to this review, several telehealth-related topics have been covered by existing education programs within tertiary and professional development levels. Therefore, to leverage adequate education, training, and compelling research activities, innovations in telehealth applications should be adopted across a variety of technology modalities. This study's findings contribute to telemedicine research and inform evidence-based policy development and decision-making. These findings can improve telemedicine utilization in remote and rural areas of Central Virginia. In addition, the evidence will benefit providers in understanding gaps in telemedicine services offered in the region.

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