

EVALUATING THE IMPACT OF TELEMEDICINE ON SURVIVAL RATES FOR
PATIENTS WITH CKD IN RURAL AREAS

by

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It is hereby recommended that the project prepared by Reagan Hill entitled *Evaluating The Impact of Telemedicine on Survival Rates for Patients with CKD in Rural Areas* be accepted in partial fulfillment of the requirements for the degree of Master of Science in Healthcare Administration.

THESIS/PROJECT APPROVED by

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Abstract

According to Domislović et al., (2022), chronic kidney disease (CKD) is one of the major global health burdens due to the high prevalence and associated risk of end-stage renal disease (ESRD). CKD disproportionately affects rural areas, where access to specialized care is limited. This study evaluates how telemedicine interventions improve survival rates among rural CKD patients. Telemedicine addresses CKD challenges by enabling remote access to nephrologists and regular monitoring. Through telecommunication technologies, patients receive timely diagnoses and interventions, overcoming geographical barriers. Remote monitoring and teleconsultations empower patients to actively engage in their healthcare, leading to better outcomes and preventing disease progression. By bridging gaps in access to specialized care, telemedicine reduces health disparities in rural areas. Previously underserved patients now have comprehensive CKD management through telehealth platforms. This approach not only improves patient outcomes but also reduces healthcare costs associated with hospitalizations and emergency care. Telemedicine transforms CKD management in rural areas by delivering timely interventions, empowering patients, and mitigating geographical barriers to healthcare access. This research contributes to understanding telemedicine's role in addressing healthcare disparities and enhancing outcomes for rural CKD populations.

Keywords: chronic kidney disease, telemedicine, rural populations, health disparities

Research Summary

This pilot study aims to evaluate the potential impact of telemedicine on survival rates among patients with chronic kidney disease (CKD) residing in rural areas. Conducted over a span of six months, the study will involve a cohort of CKD patients recruited from rural clinics across diverse geographical regions. Participants will be randomly assigned to either receive standard care or participate in a telemedicine intervention, which includes remote monitoring of vital signs, medication management, and virtual consultations with nephrologists. Data on patient demographics, disease severity, treatment adherence, and clinical outcomes should be collected at baseline and at regular intervals throughout the study period.

Preliminary analysis is expected to reveal promising trends, suggesting that patients who received telemedicine interventions experienced fewer adverse events and complications compared to those receiving standard care. Additionally, a higher proportion of telemedicine participants is expected to exhibit improved medication adherence and reported higher satisfaction levels with their healthcare experience. While the study is ongoing, these preliminary findings will underscore the potential of telemedicine to positively impact survival rates and overall outcomes for CKD patients in rural areas. Further research is warranted to validate these findings on a larger scale and assess telemedicine interventions' long-term sustainability and effectiveness in this population.

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Introduction

“According to the Centers for Disease Control and Prevention (CDC), almost 90% of people who have kidney disease don’t even know it. Although one in three Americans are at risk for developing kidney disease, the National Kidney Foundation pointed out that “Black or African Americans are more than 3 times as likely — and Hispanics or Latinos are 1.3 times more likely — to have kidney failure compared to White Americans,” important information for populations of color in a rural America that is becoming more diverse” (Temple, 2022).

Unfortunately, chronic kidney disease can severely impact a patient’s bill of health and can lead to other chronic illnesses or diseases. The kidneys play a vital role in eliminating waste from the human body and if the kidney cannot properly filter the blood before it runs to the organs, the patient may be at high risk for cardiovascular disease.

According to the Arkansas Department of Health, in 2015, Arkansas ranked 5th in the nation for kidney disease mortality. A total of 707 Arkansans died due to kidney disease. The state also showed high numbers of diabetes and hypertension. These two conditions, particularly if uncontrolled, can lead to kidney function issues. Limited access to adequate patient care, resources, and transportation can make it difficult for patients to actively participate in their treatment plans and advocate for their healthcare. Locating adequate care may also be a financial burden for patients if they don’t have insurance coverage.

“The Census Bureau defines rural as any population, housing, or territory not in an urban area” (U.S. Department of Agriculture, n.d.). Urbanized areas are considered to have a population of 50,000 or more people. “The federal government classifies areas and population for statistical, programming, and funding purposes” (U.S. Department of Agriculture, n.d.).

Definition of Terms

Rural: The term "rural" refers to areas and communities characterized by sparse population density, typically outside urban centers, or cities. Rural areas are often associated with agricultural, natural, or wilderness landscapes and may have limited access to amenities, services, and infrastructure compared to urban areas. The definition of rural can vary depending on the context, such as geographical location, administrative boundaries, and socio-economic factors. Generally, rural regions are distinguished by their smaller populations, slower pace of life, and reliance on traditional industries such as farming, forestry, and mining.

Health Disparities: Health disparities refer to differences in health outcomes or access to healthcare services between distinct populations or demographic groups. These disparities can manifest in various forms, including variations in disease prevalence, incidence, morbidity, mortality rates, and healthcare utilization patterns. Health disparities are often associated with social determinants of health, such as socioeconomic status, race/ethnicity, gender, geographic location, education level, and access to healthcare resources.

Chronic Kidney Disease (CKD): Chronic Kidney Disease (CKD) is a progressive and long-term condition characterized by the gradual loss of kidney function over time. The kidneys play a crucial role in filtering waste products and excess fluids from the blood, regulating electrolyte balance, and producing hormones that control blood pressure and stimulate red blood cell production. In CKD, the kidneys become damaged and are unable to perform these functions effectively.

Telemedicine/telehealth: Telemedicine, also known as telehealth, refers to the delivery of healthcare services and information remotely using telecommunications technology. This can include a wide range of healthcare services, such as medical consultations, diagnoses, monitoring, education, and treatment, conducted through audio, video, or other electronic communication methods. Telemedicine enables patients to access healthcare services from a distance, overcoming geographical barriers and increasing convenience, particularly in areas with limited access to healthcare facilities or specialists.

Social determinants: Social determinants of health (SDOH) refer to the social, economic, cultural, environmental, and structural factors that influence health outcomes and disparities within populations. These determinants encompass a wide range of conditions and circumstances in which people are born, grow, live, work, and age, shaping their overall health status and well-being.

Problem Statement

My problem statement focuses on identifying how telemedicine affects survival rates for patients who have CKD and reside in rural counties in Arkansas. The rural communities of Arkansas are rich with cultural diversity and history but often lack the resources needed for optimal health and wellness. According to the Arkansas Department of Health, 41 percent of Arkansans call rural communities their home, but the healthcare resources needed to sustain their lives and improve their health are not easily available. Many of these rural residents suffer from poor health outcomes and behaviors that jeopardize their quality of life. Health disparities are most prominent in rural areas and occur when differences in healthcare stem from broader inequities. “Disparities in morbidity and mortality between urban and rural residents are well-documented and have been referred to as the “rural mortality penalty.” Rural residents have not seen the same health improvements as their urban counterparts, and population trends indicate that the disparity is large and growing” (Beasley & Stanifer, 2019). Health disparities are a key influencing factor in the inequity shown throughout our healthcare system today. Individuals living in rural communities are more likely to develop chronic diseases and experience poorer health outcomes based on where they live and other social determinants that may play a role in their ability to access quality healthcare services.

Purpose Statement

Chronic kidney disease (CKD) is one of the major global health burdens due to the high prevalence and associated risk of end-stage renal disease (ESRD). In addition, CKD is an independent risk factor for cardiovascular disease and premature deaths (Domislović et al., 2022). Utilizing telemedicine for the care of people with chronic kidney disease is feasible for

patients at any stage of the disease and applicable to different healthcare professionals. The evidence shows that telehealth favors lower cost, accessibility to remote locations, and better monitoring of dialysis with positive results in symptom control, risk reduction, and patient training.

Health information technology plays an important role in the delivery of quality healthcare services, and it is vital to the success of an organization. “As organizations struggle to meet patient and community health needs and improve quality with tight budgets, performing a strict value assessment of all investments has become even more important” (Glandon et al., 2020).

Research Question

I hypothesize that patients with chronic kidney disease (CKD) in rural areas within Arkansas who have access to telemedicine and additional resources will experience better results and quality of care versus patients who have access to limited resources.

Healthcare disparities in rural areas are a significant and complex issue. Several factors contribute to the prevalence of healthcare disparities in rural communities. Addressing healthcare disparities in rural areas requires a comprehensive approach that involves improving access to healthcare services, addressing workforce shortages, investing in infrastructure, and promoting health education and awareness tailored to the specific needs of rural communities.

Healthcare technology advancements have the potential to enhance patient outcomes significantly. Ongoing research, collaboration between technology developers and healthcare professionals, and thoughtful implementation strategies are key to maximizing the positive impact of technology on patient care and outcomes. Telehealth was originally developed to

provide basic care to rural and underserved patients. This tool encourages patients to be more involved and take charge of their healthcare plan.

Hypothesis

Technological innovation has always had a hand in the advancement of healthcare through the types of medical tools used, machines, electronic charting systems, advanced techniques, and the list continues. Research shows that the increasing advancements in healthcare technology have a profound impact on patient outcomes. Telehealth technologies enable remote monitoring of patients with chronic conditions or those recovering from surgeries. This facilitates real-time tracking of vital signs and other health metrics, allowing healthcare providers to intervene promptly if any issues arise. Remote monitoring can lead to better management of chronic diseases and reduced hospital readmissions.

Telemedicine services refer to the provision of medical care, consultation, diagnosis, treatment, and monitoring of patients remotely using telecommunications technology. This can include video calls, phone calls, secure messaging platforms, and other digital communication tools. Telemedicine enables healthcare professionals to evaluate, diagnose, and treat patients without the need for in-person visits, making healthcare more accessible, convenient, and efficient, particularly for individuals in rural or remote areas, or those with limited mobility. Telemedicine services encompass a wide range of medical specialties and can include virtual appointments with doctors, specialists, therapists, and other healthcare providers, as well as remote monitoring of patients' health status and the exchange of medical information between providers for collaborative care.

H₀: Telemedicine has no significant effect on survival rates for patients with chronic kidney disease in rural areas. Ultimately, there is no difference in survival rates for CKD patients in rural areas who choose to receive telemedicine interventions versus those who do not.

H_a: Telemedicine positively affects survival rates for patients with CKD in rural areas.

Significance of Study

A pilot study examining the impact of telemedicine on survival rates for patients with chronic kidney disease (CKD) in rural areas holds significant implications in several key areas. Firstly, it serves as a crucial feasibility assessment, allowing researchers to evaluate the practicality and achievability of implementing telemedicine interventions in rural settings for CKD management. By identifying logistical, technical, and social challenges associated with telemedicine adoption, such as internet connectivity issues or patient acceptance barriers, the pilot study informs subsequent interventions.

Furthermore, through methodological refinement, the pilot study ensures that data collection, monitoring, and intervention delivery protocols are optimized for the main study, enhancing its reliability and validity. While not conclusive, the initial effectiveness assessment provided by the pilot study offers valuable insights into the potential impact of telemedicine on CKD patient outcomes, including survival rates. By estimating sample sizes and informing decision-making processes related to resource allocation and policy development, the pilot study guides the design and implementation of telemedicine programs for CKD management in rural areas. Ultimately, by building stakeholder confidence through positive findings and supporting evidence-based healthcare interventions, the pilot study plays a foundational role in addressing

healthcare disparities and improving outcomes for CKD patients in underserved rural communities.

Literature Review

According to the American Kidney Fund (2023) “37 million people in the United States have chronic kidney disease. That is more than 1 in 7 adults”. When people develop chronic kidney disease (CKD), their kidneys become damaged and, over time, lose their ability to filter waste and fluid from the blood. If a person’s kidneys are not functioning properly, toxic waste and extra fluid will accumulate in the body and may cause other chronic illnesses such as high blood pressure, diabetes, and heart disease, which can lead to kidney failure, stroke, or early death. Chronic kidney disease may develop for several reasons. The most common causes are diabetes and high blood pressure. “Other risk factors include heart disease, obesity, a family history of CKD, inherited kidney disorders, past damage to the kidneys, and older age.”

Diabetes is one of the most common causes of CKD because over time, high blood sugar can damage the blood vessels in the kidney and nephrons, which are the filtering units of the kidney, preventing them from working as they should. It’s also not uncommon for people with diabetes to develop high blood pressure. High blood pressure is another common cause of CKD because this illness also damages the blood vessels and kidneys, but in a different way than diabetes. Uncontrolled hypertension causes arteries around the kidney to narrow, weaken, or harden. Continuous damage to the body’s blood vessels and arteries prevents it from delivering enough blood to the kidney tissues. Damaged arteries don’t filter blood as they should and lose their ability to regulate the amount of fluid and toxins in the blood and damaged kidneys cannot regulate blood pressure. Ultimately, this leads to a downward spiral and can result in end-stage renal disease (ESRD).

Health Disparities

According to the CDC (2023), about 15% of the U.S. population lives in rural areas. “Rural Americans are more likely to die from heart disease, cancer, unintentional injury, chronic lower respiratory disease, and stroke than their urban counterparts. Unintentional injury deaths are approximately 50 percent higher in rural areas than in urban areas, partly due to a greater risk of death from motor vehicle crashes and opioid overdoses. In general, residents of rural areas in the United States tend to be older and sicker than their urban counterparts” (CDC, 2023). Health disparities are most prominent in rural areas and occur when differences in healthcare stem from broader inequities. “Disparities in morbidity and mortality between urban and rural residents are well-documented and have been referred to as the “rural mortality penalty.” Rural residents have not seen the same health improvements as their urban counterparts, and population trends indicate that the disparity is large and growing” (Beasley & Stanifer, 2019).

There is a lack of evidence that examines the ethnic and racial issues that mainly prevent black/African American and other ethnic and minority groups within rural areas in Arkansas from receiving the proper resources and access to healthcare services. “Black and American Indian/Alaska Native (AIAN) people live fewer years, on average, than white people and are at higher risk for many chronic health conditions. They are also more likely to die from treatable conditions; more likely to die during or after pregnancy and to suffer serious pregnancy-related complications; and more likely to lose children in infancy” (Radley et al., 2021). The prominence of health disparities in rural black communities is evident. Previously completed studies identify language barriers, income, education, location, and inadequate insurance coverage as the main challenges these groups face. “Rural communities have limited access to public health services, with rural-serving public health agencies operating under inadequate

funding, unmet technology needs, and limited physical and human infrastructure” (Rural Health Information Hub, n.d.).

Previously conducted studies identify the potential for biased results due to measurement error. “Addressing measurement issues in the assessment of health status may contribute to a better understanding of health issues in cross-cultural research. Approaches used to assess the magnitude and nature of bias in measures when applied to diverse groups include qualitative analyses, classic psychometric studies, as well as more modern psychometric methods. These approaches should be applied sequentially, and/or iteratively during the development of measures.” (Ramírez et al., 2005).

The goal is to identify health policies that can be implemented across the state to aid in allocating the proper funding and resources in these areas and allow these individuals adequate access to healthcare services. While previous studies have identified the lack of resources and services provided, I’ve found that a gap in research remains regarding a plan of action to address this critical factor in public and global health initiatives.

Addressing health disparities will aid in improving state and national efforts to achieve health equity. The Centers for Medicare & Medicaid Services (2023) “defines health equity as the attainment of the highest level of health for all people, whereby every person has a fair and just opportunity to attain optimal health regardless of their race, ethnicity, disability, sexual orientation, gender identity, socioeconomic status, preferred language, and geography—including whether they live in a rural or other underserved community”.

Social determinants contribute widely to health inequities in rural areas when compared to urban areas. “Social determinants of health (SDOH) are the conditions in the environments where people are born, live, learn, work, play, worship, and age that affect a wide range of

health, functioning, and quality-of-life outcomes and risks. SDOH can be grouped into 5 domains including economic stability, education access and quality, healthcare access and quality, neighborhood and environment, and social and community context” (U.S. Department of Health and Human Services).

Telemedicine in Rural Health

Telemedicine has emerged as a promising solution to address healthcare disparities in rural areas, where access to medical services is often limited. By leveraging telecommunications technology, telemedicine enables remote delivery of healthcare services, including consultations, diagnosis, and treatment, to patients in rural and underserved communities. Research suggests that telemedicine can significantly improve access to healthcare in rural areas, reducing travel burdens and overcoming geographical barriers (Bashshur et al., 2019).

Moreover, telemedicine has been shown to enhance patient outcomes by facilitating early intervention, preventive care, and chronic disease management (Nelson & Stagers, 2020). For instance, telemedicine programs for managing chronic conditions like diabetes and hypertension have demonstrated positive outcomes in rural populations, including improved health outcomes and reduced healthcare costs (Tuckson et al., 2017). Additionally, telemedicine offers opportunities for collaboration among healthcare providers, enabling specialists from urban areas to remotely consult and support primary care providers in rural settings (Kruse et al., 2017). Despite its potential benefits, challenges such as limited broadband infrastructure, reimbursement policies, and provider resistance need to be addressed to ensure the widespread adoption and effectiveness of telemedicine in rural health (Kruse et al., 2018). Overall, telemedicine holds promise as a transformative tool to bridge the healthcare gap in rural areas, enhancing access, quality, and efficiency of care delivery.

Successes of Telemedicine

Telemedicine has demonstrated numerous successes across various aspects of healthcare delivery, contributing to improved access, quality of care, and patient outcomes. One significant success of telemedicine lies in its ability to expand access to healthcare services, particularly in underserved and rural areas. Through telemedicine platforms, patients can connect with healthcare providers remotely, overcoming geographical barriers and reducing the need for travel, thereby improving access to specialized care (Bashshur et al., 2019). Telemedicine has shown efficacy in enhancing the management of chronic conditions. Patients with chronic diseases such as diabetes, hypertension, and chronic obstructive pulmonary disease (COPD) can benefit from remote monitoring and virtual consultations, leading to better disease management, reduced hospitalizations, and improved quality of life (Bashshur et al., 2016).

Telemedicine has proven effective in facilitating timely interventions and consultations, particularly in emergency and critical care settings. Telemedicine platforms enable rapid communication between healthcare providers, allowing for real-time assessment, diagnosis, and treatment recommendations, which can significantly improve patient outcomes and reduce mortality rates (Hollander & Carr, 2020). Furthermore, telemedicine has demonstrated cost-effectiveness by reducing healthcare expenditures associated with unnecessary hospital visits, readmissions, and travel expenses for patients and caregivers (Kruse et al., 2017). Overall, the successes of telemedicine underscore its transformative potential in enhancing healthcare delivery, fostering greater accessibility, efficiency, and effectiveness in meeting the diverse needs of patients and healthcare systems.

Telemedicine in Multiple Different Areas of Medicine

Telemedicine has demonstrated its versatility and effectiveness across various medical specialties, revolutionizing healthcare delivery in numerous areas. In primary care, telemedicine offers convenient access to routine consultations, preventive care, and chronic disease management. Patients can consult with primary care providers remotely for minor ailments, prescription refills, and follow-up visits, reducing the need for in-person appointments and enhancing overall accessibility (Smith et al., 2019).

In mental health, telepsychiatry has emerged as a valuable tool for delivering mental health services, especially in regions with limited psychiatric resources. Telepsychiatry enables patients to receive counseling, therapy, and medication management remotely, fostering greater access to mental healthcare and reducing the stigma associated with seeking treatment (Hilty et al., 2013). In dermatology, teledermatology facilitates the remote diagnosis and management of skin conditions through the use of images and digital communication. Patients can upload photos of their skin lesions or rashes, allowing dermatologists to provide timely assessments and treatment recommendations, leading to improved outcomes and reduced wait times for specialist care (Lee et al., 2018).

In rural and underserved areas, telemedicine helps address healthcare disparities by connecting patients with specialists who may not be available locally. For example, telestroke programs enable remote assessment and treatment of stroke patients by neurologists, enabling timely administration of thrombolytic therapy and improving clinical outcomes (Demaerschalk et al., 2017). In chronic disease management, telemonitoring allows healthcare providers to remotely track patients' vital signs, medication adherence, and disease progression. This

proactive approach enables early detection of complications and timely interventions, leading to better disease control and reduced hospitalizations (Inglis et al., 2017).

In emergency medicine, telemedicine facilitates remote consultations between emergency physicians and specialists, enabling timely evaluation and treatment of critically ill patients. Telemedicine platforms can also support pre-hospital triage and decision-making, improving resource utilization and patient outcomes in emergency settings (Ward et al., 2018). Overall, telemedicine has emerged as a versatile and valuable tool in various medical specialties, offering enhanced access, convenience, and quality of care for patients while optimizing healthcare delivery and resource utilization.

Survival Rates of CKD

Chronic Kidney Disease (CKD) poses significant health challenges globally, and understanding its survival rates is crucial for healthcare providers and policymakers alike. Survival rates in CKD vary depending on several factors, including the stage of the disease, comorbidities, and access to healthcare resources. Research indicates that the prognosis for CKD worsens as the disease progresses to more advanced stages. A study by Matsushita et al. (2010) found that individuals with CKD Stage 1 had a relatively low risk of mortality compared to those with Stages 4 and 5. Additionally, comorbid conditions such as cardiovascular disease, diabetes, and hypertension significantly impact CKD survival rates, with these conditions often exacerbating kidney dysfunction and increasing mortality risk (Tonelli et al., 2016).

Access to healthcare resources and timely interventions also play a critical role in CKD survival outcomes. For instance, patients who receive early detection and management of CKD through regular screenings and appropriate treatment modalities, such as medication and lifestyle modifications, tend to have better survival rates compared to those with delayed diagnosis and

inadequate management (Ene-Iordache et al., 2016). Moreover, advancements in renal replacement therapies, such as dialysis and kidney transplantation, have improved survival rates and quality of life for individuals with end-stage renal disease (ESRD) (Chang et al., 2018). Overall, while CKD survival rates vary depending on multiple factors, early detection, comprehensive management, and access to renal replacement therapies are crucial for improving outcomes and reducing mortality in individuals affected by this chronic condition.

Methodology

The methodology for evaluating the impact of telemedicine on survival rates for patients with CKD in rural areas involves a comprehensive approach to data collection, analysis, and interpretation. Initially, the study will identify rural areas with significant CKD prevalence and limited access to healthcare facilities, ensuring representative sampling. Subsequently, a retrospective cohort study design will be employed, utilizing medical records and telemedicine databases to gather relevant patient information. The study will focus on patients diagnosed with CKD who have received telemedicine services for their condition.

To assess survival rates, a comparison will be made between patients who have utilized telemedicine for CKD management and those who have not. Ethical considerations, including patient privacy and informed consent, will be carefully addressed throughout the study. Ultimately, the methodology aims to provide robust evidence on the effectiveness of telemedicine in improving survival rates for patients with CKD in rural areas, informing future healthcare policy and practice in these underserved communities. Since this study is structured as a pilot study, the information gathered is expected to be valuable when used to conduct a larger study.

Figure 1: The table below evaluates ten different dimensions and identifies the traditional and stereotypical differences between urban and rural areas (Scott & Gilbert, 2007).

Table 1: Traditional Stereotypical Differences between Urban and Rural Populations

DIMENSION	URBAN	RURAL
1. Economy	Secondary and tertiary sector dominant	Primary industry sector and supporting activities dominant
2. Employment	Manufacturing, construction, administration and services	Agriculture, forestry and other primary industry occupations
3. Education	Higher than national averages	Lower than national averages
4. Services Accessibility	High	Low
5. Information Accessibility	High	Low
6. Sense of Community	Low	High
7. Demography	Low fertility and mortality	High fertility and mortality
8. Political Views	Liberal and radical elements more strongly represented	Conservative, resistance to change
9. Ethnicity	Varied	White
10. Migration	High; generally net in-migration	Low; generally net out-migration

Rural vs Urban Arkansas Counties

There are 75 counties total in the state of Arkansas, approximately 42 of those counties are considered rural counties, with 8 of those counties being eligible to be classified as rural counties even though designated as a metropolitan county under an exception for outlying counties that do not have any urbanized area population (HRSA, 2021).

In Arkansas, rural and urban counties differ in various aspects, such as population density, economic activities, and access to services. Rural counties are characterized by lower population densities, with communities often centered around agriculture, forestry, and mining.

These areas typically have limited access to healthcare services, fewer infrastructural amenities, and a slower pace of life than urban areas.

In contrast, urban counties like Pulaski, Washington, Benton, and Sebastian are more densely populated and economically diverse. They feature bustling cities and suburban neighborhoods and a wide range of industries, such as healthcare, education, technology, and manufacturing. Access to healthcare, transportation, and other services is generally more readily available in urban counties.

Overall, while rural Arkansas counties embody a quieter, more agrarian lifestyle, urban counties are hubs of economic activity and offer greater access to amenities and opportunities.

National & State Level Classifications

National and state-level classifications for chronic kidney disease (CKD) in rural areas are essential for understanding the epidemiology, healthcare infrastructure, and healthcare access and outcomes disparities. At the national level, classifications often involve comprehensive data collection and analysis to determine CKD prevalence, risk factors, and burden across different demographic groups, including rural populations. For instance, national health surveys and studies, such as the National Health and Nutrition Examination Survey (NHANES) in the United States or similar surveys conducted in other countries, provide valuable insights into CKD prevalence and associated factors in rural areas (CDC, 2020). These surveys typically involve representative samples of the population and include rural residents, enabling researchers and policymakers to assess the scope of the problem and tailor interventions accordingly.

At the state level, classifications for CKD in rural areas often focus on regional disparities in healthcare access, resources, and outcomes. States may categorize rural regions based on population density, socioeconomic status, and availability of healthcare facilities.

Academic research conducted in specific states, such as studies examining CKD prevalence and healthcare disparities in rural areas of states like California (Babey et al., 2015) or Texas (Al Mawed et al., 2017), provide valuable insights into the unique challenges faced by rural populations. These studies often utilize state-level healthcare data, including hospital records, health surveys, and administrative databases, to identify areas with higher CKD burden and disparities in healthcare access.

State-level classifications may involve the development and implementation of targeted public health programs and policies to address CKD in rural areas. For example, in rural healthcare settings, states may establish initiatives to improve access to preventive services, such as screening for CKD risk factors and early detection programs. Academic research evaluating the effectiveness of such interventions, such as community-based screening programs or telemedicine initiatives, can inform evidence-based policymaking at the state level (Tuot et al., 2018). Additionally, collaborations between state health departments, academic institutions, and community organizations are crucial in implementing and evaluating interventions to reduce CKD disparities in rural areas.

National and state-level classifications for CKD in rural areas provide valuable insights into the epidemiology, healthcare infrastructure, and disparities in healthcare access and outcomes. Academic research utilizing national surveys and state-level healthcare data contributes to our understanding of the challenges faced by rural populations and informs the development of targeted interventions and policies to address CKD in these communities.

Data Collection

The quantitative research methods used for this research project include descriptive and correlational research. Descriptive research aims to investigate and characterize the researcher's distribution of one or more variables without considering any existing causal theories or other assumptions. “Descriptive studies are useful for estimating the burden of disease (e.g., prevalence or incidence) in a population” (Aggarwal & Ranganathan, 2019). On the other hand, “correlational research aims to find out if there are differences in the characteristics of a population depending on whether or not its subjects have been exposed to an event of interest in the naturalistic setting” (Lau, 2017).

The chosen methods for data collection will aid in identifying any health disparities present in the counties selected, what effect that may have on their ability to access adequate care and telehealth, and the likelihood of developing CKD when compared to the surrounding urban areas. “In Arkansas, 41% of the population live in rural counties. Our state is a very rural one, so when we work to expand our economy, we must always recognize the challenges that our rural communities face” (Arkansas House of Representatives, 2019).

One area that I would primarily like to focus on is rural counties located in Southeast Arkansas. I would conduct a community needs assessment for the counties in Southeast Arkansas to identify if healthcare disparities are present and prevent members of the community to achieve and maintain optimal health. The 10 counties located in the Southeast Arkansas region include Arkansas, Ashley, Bradley, Chicot, Cleveland, Desha, Drew, Grant, Jefferson, and Lincoln. The demographic-related data collected is essential because it helps identify possible health disparities and can help improve the quality of care for all patients. Identifying and

addressing the differences in these populations plays a significant role in distinguishing which populations do not achieve optimal interventions.

Setting and Population

In the study focusing on evaluating the impact of telemedicine on survival rates for patients with CKD in rural areas, the setting encompasses various rural regions across the targeted area. These rural areas are characterized by lower population densities, limited access to specialized healthcare facilities, and geographic isolation from urban centers. Communities within these rural regions often face challenges in accessing timely medical care due to factors such as long travel distances and a shortage of healthcare providers. Additionally, the socioeconomic landscape of these rural areas may influence healthcare access, with disparities in income levels and insurance coverage impacting the ability of residents to seek and afford medical treatment. Understanding the unique setting of rural areas is essential for contextualizing the study's findings and addressing the specific needs of these underserved communities.

The population under study consists of individuals diagnosed with CKD residing in rural areas. This population may include individuals of varying ages, socioeconomic backgrounds, and stages of CKD progression. Due to limited access to healthcare services in rural regions, patients with CKD in these areas may face challenges in receiving timely diagnosis, specialized treatment, and ongoing management of their condition. The population may also exhibit diverse healthcare-seeking behaviors and preferences, influenced by factors such as cultural beliefs, transportation barriers, and availability of local healthcare providers. Understanding the demographic and clinical characteristics of this population is crucial for assessing the impact of telemedicine interventions on survival rates and informing strategies to improve CKD care delivery in rural settings.

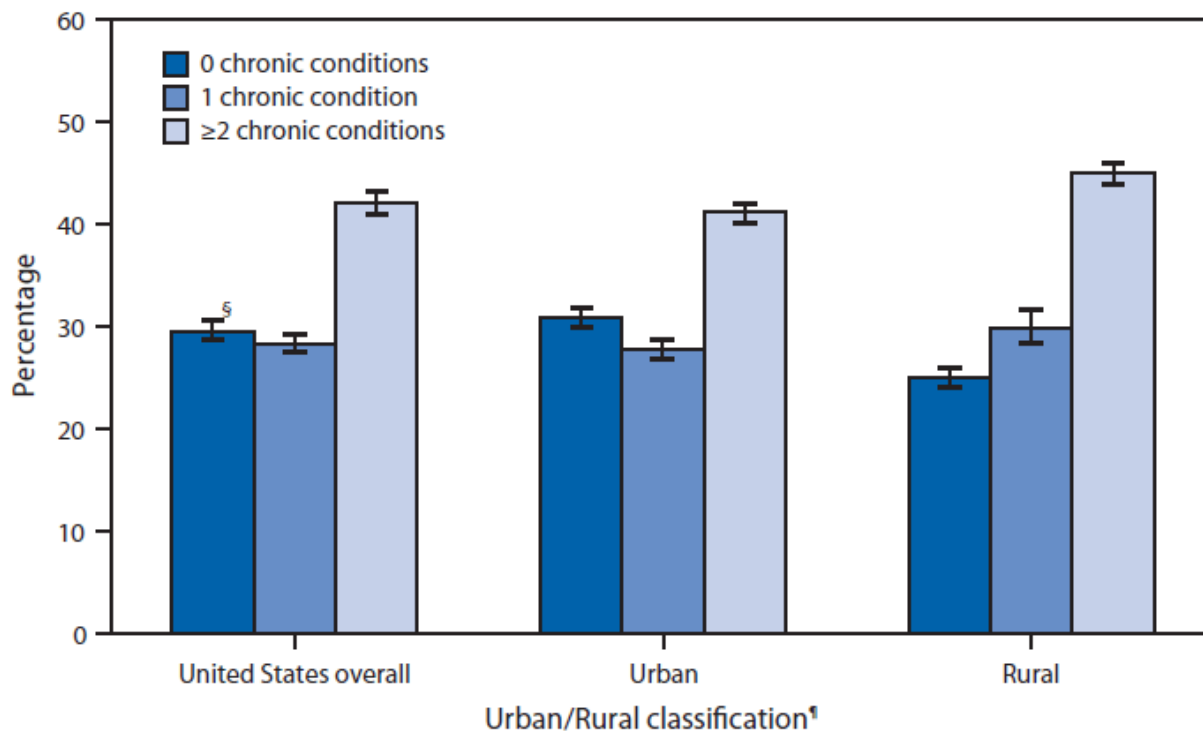


Figure 2: Displays the prevalence of chronic conditions, estimates are based on household interviews using the U.S. census definitions to classify areas as urban or rural.

Ethical Consideration

When conducting research on the impact of telemedicine on survival rates for patients with chronic kidney disease (CKD) in rural areas, several ethical considerations must be carefully addressed to ensure the protection of participants' rights and well-being. First and foremost is the principle of beneficence, which requires researchers to prioritize the welfare of participants and maximize potential benefits while minimizing risks. In this context, researchers must consider whether the implementation of telemedicine interventions could lead to improved access to healthcare services, timely interventions, and ultimately, better survival outcomes for patients with CKD residing in rural areas.

Additionally, it's important to uphold the principle of non-maleficence, ensuring that the telemedicine interventions under investigation do not cause harm or exacerbate existing health disparities among participants. It is crucial to assess potential risks associated with telemedicine, such as breaches of patient privacy, data security concerns, or disruptions in continuity of care, particularly in rural communities with limited access to healthcare resources. Mitigation strategies, such as robust data encryption protocols, secure telecommunication platforms, and clear communication of risks to participants, should be implemented to safeguard against potential harm.

Respecting participants' autonomy and ensuring informed consent are essential ethical considerations in research involving telemedicine interventions. As a researcher in this study, I understand that I must provide comprehensive information about the purpose, procedures, risks, and benefits of the study to potential participants, allowing them to make autonomous decisions about their involvement. Given the potential challenges of accessing telemedicine services in rural areas, it's also important to consider the availability of alternative options for participants who may prefer traditional in-person care or face barriers to telemedicine access.

Furthermore, in this type of study, it's vital to uphold principles of justice and equity, ensuring fair distribution of the benefits and burdens of participation in the research study. It is imperative to address disparities in access to telemedicine services, technological infrastructure, and healthcare resources that may disproportionately affect rural populations with CKD. I will strive to design inclusive and culturally sensitive telemedicine interventions that account for the unique needs, preferences, and challenges faced by rural communities.

Researching the impact of telemedicine on survival rates for patients with CKD in rural areas requires careful consideration of ethical principles, including beneficence, non-

maleficence, respect for autonomy, and justice. By addressing these ethical considerations, researchers can ensure the ethical conduct of their studies, protect participants' rights, and contribute to the advancement of knowledge in telemedicine and rural healthcare delivery.

Privacy

Ethical considerations surrounding privacy concerns in telemedicine are paramount in ensuring patient trust, autonomy, and confidentiality. One of the primary ethical principles guiding telemedicine practices is patient confidentiality. Healthcare providers have an ethical obligation to safeguard patient information, including sensitive medical data shared during telemedicine consultations, to maintain trust and preserve the patient-provider relationship. Informed consent plays a crucial role in upholding patient autonomy and privacy rights in telemedicine. Patients must receive clear information about the purpose, risks, benefits, and limitations of telemedicine services, as well as their rights regarding the privacy and security of their health information, before consenting to participate in telemedicine encounters.

Adherence to data security measures and compliance with regulations such as the Health Insurance Portability and Accountability Act (HIPAA) are essential ethical considerations in telemedicine. Telemedicine platforms and healthcare providers must implement robust security protocols, encryption technologies, and access controls to protect patient data from unauthorized access, breaches, or misuse. Furthermore, minimizing data collection and ensuring ethical use of patient data are critical ethical considerations in telemedicine to prevent the exploitation of patient information for commercial gain or non-consensual sharing with third parties. Overall, prioritizing patient privacy and confidentiality through informed consent, data security measures, and ethical data practices is essential for upholding ethical standards and protecting patient rights in telemedicine.

Connection Issues

Ethical considerations regarding potential connection issues in telemedicine are crucial for ensuring patient safety, continuity of care, and adherence to professional standards. One primary ethical principle that guides telemedicine practice is beneficence, which emphasizes the duty to act in the best interests of patients and promote their well-being. When addressing connection issues in telemedicine, healthcare providers must prioritize patient safety by implementing contingency plans to mitigate the impact of technical disruptions on patient care. This may involve establishing protocols for alternative communication methods, such as phone calls or messaging platforms, to ensure continued access to healthcare services in the event of connectivity problems. Providers should regularly assess the reliability and stability of telecommunication systems and make informed decisions about the appropriateness of telemedicine for individual patients based on their specific needs and circumstances.

Respecting patient autonomy and informed consent are also critical ethical considerations in telemedicine, particularly concerning potential connection issues. Patients must be adequately informed about the risks and limitations of telemedicine, including the possibility of technical difficulties or interruptions in communication, before consenting to participate in telemedicine encounters. Transparent communication about the potential impact of connection issues on the delivery of care allows patients to make informed decisions about their healthcare options and preferences. Healthcare providers should empower patients to actively participate in decision-making regarding the use of telemedicine and provide them with opportunities to express concerns or preferences regarding connectivity issues.

Telemedicine providers have a professional obligation to maintain competence in managing technical challenges and ensuring the quality and safety of telemedicine encounters.

This includes staying informed about advancements in telecommunication technologies, troubleshooting connection issues promptly, and seeking assistance or consultation when necessary to minimize disruptions in patient care. Healthcare organizations are responsible for establishing policies and procedures for addressing connection issues, including documentation of technical difficulties, rescheduling of appointments, and escalation pathways for resolving persistent connectivity problems.

Implementing telemedicine within a practice or organization requires providers to uphold principles of justice and equity in telemedicine practice, ensuring fair access to healthcare services for all patients, regardless of geographical location or technological literacy. Efforts to address disparities in access to telemedicine, such as providing assistance with technology adoption or offering alternative care options for patients with limited connectivity, are essential for promoting equitable healthcare delivery and reducing health inequities.

Ethical considerations regarding potential connection issues in telemedicine underscore the importance of prioritizing patient safety, autonomy, and equitable access to care. By addressing these ethical considerations, healthcare providers can navigate technical challenges in telemedicine practice responsibly and uphold the highest standards of ethical conduct in delivering patient-centered care.

Results/Findings

In my effort to evaluate the effect of telemedicine on survival rates for patients with CKD in rural areas, I am structuring this study as a pilot study. “Pilot studies are important for the quality and efficiency of main studies. They are conducted in order to assess the safety of treatment or intervention strategies, examine the randomization or blinding process, and

ultimately increase the researchers' experience with the study methods chosen for use" (In, 2017).

Assessing the effectiveness of telemedicine as an intervention strategy for improving survival rate amongst CKD patients considers several different components including patient accessibility to a mobile device or computer, internet connectivity and strength, confidentiality and access to a private area, and overall comprehension. A pilot study will assess the feasibility of completing this study by considering criteria requirements for participants, preparation of the intervention, in this case, telehealth services, and training of researchers and assistants.

I will also perform a regression analysis in completion of this study. A regression analysis uses quantitative data to determine which variables have an impact. In this case, it will rule out which factors matter the most when utilizing telehealth services to achieve more favorable outcomes for CKD patients and possibly other patients with chronic diseases and illnesses. The dependent variable identified is whether telemedicine affects survival rates or not.

While there are cases when patients may need to have more frequent in-person visits with their provider, telehealth is an efficient option when that is not the case. "Advancements in technology allows providers and patients the flexibility to monitor their chronic conditions without routine trips into the office" (Gajarawala & Pelkowski, 2021). Telehealth care poses benefits for both patients and providers due to efficiency, convenience, and more routine follow-ups. If patients are able to meet with their doctors more frequently, they are more likely to follow their treatment plan, be more involved, and eventually see improvement in their overall health. According to (Gajarawala & Pelkowski, 2021), "more frequent check-ins through telehealth, and the possibility of remote patient monitoring, can help providers catch any complication faster. Doing so could lead to fewer hospitalizations and emergency room visits". Telemedicine has

been around for decades, but the usage and advancement drastically increased during the COVID-19 pandemic. The graph below shows a visual representation of telemedicine use and decrements to type 2 diabetes and hypertension during the COVID-19 pandemic, with these being two of the leading causes of CKD, it is important to highlight them.

**Telemedicine use & decrements to Type 2 Diabetes and Hypertension Care
during COVID-19 Pandemic**

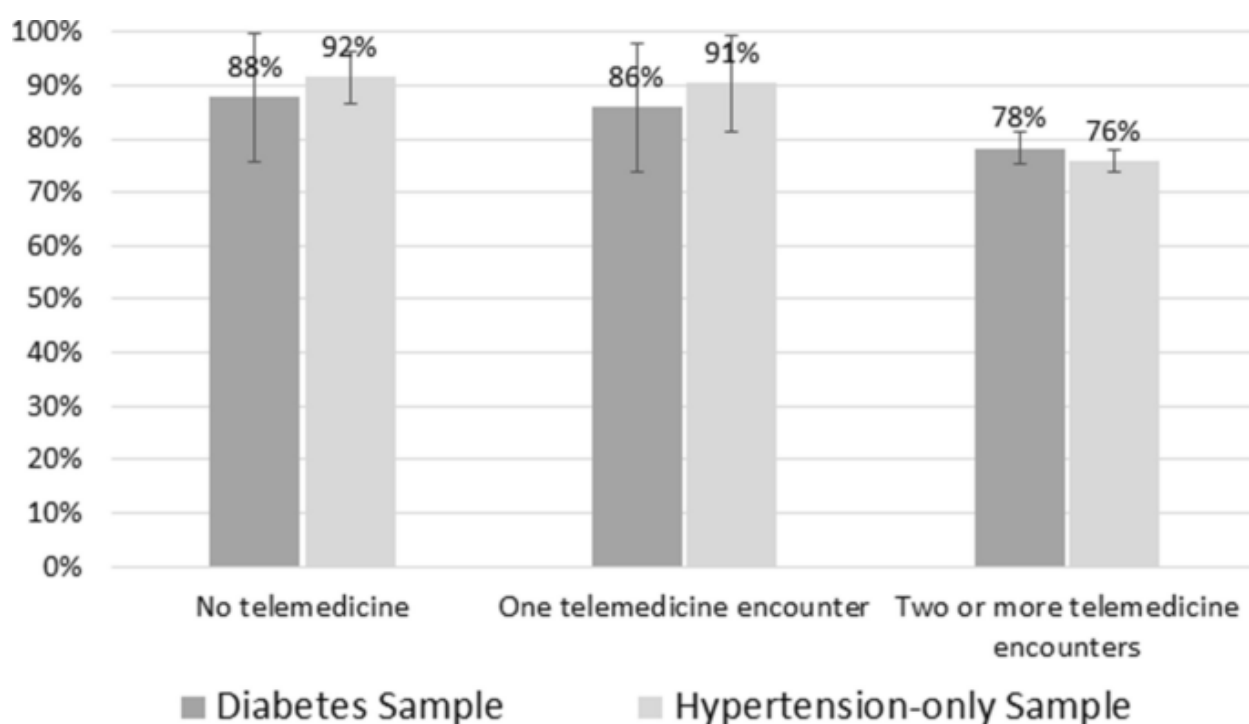


Figure 3: “Predicted probabilities of blood pressure testing by sample population and telemedicine encounters. Note: Telemedicine encounters include audio, video, and e-visits. Predicted probabilities account for all control variables included in the final multivariable regression models. ¹HbA1c is considered under control if the patient’s HbA1c test result is less than 8.0%. ²Blood pressure is considered under control if the patient’s last recorded systolic and diastolic blood pressure values are below 140 mmHg and 90 mmHg, respectively” (Rodriguez et al., 2024).

Discussion

Despite the constant improvement of healthcare services, treatment plans, and technologies, if health disparities are not properly addressed in prevalent areas, our country will continually struggle to achieve health equity. Previously conducted studies identify the presence of health disparities, racial and ethnic groups who are most affected, and geographical areas that are most affected, and identify how these overall damages the healthcare system, yet no active solutions have been given. According to Riley (2012), major contributors to the problem of health disparities are the cost and access to medical care. Clear disparities also exist in the rates of health insurance coverage among black and Latino population groups. A study even identified that lower-performing hospitals tend to treat higher percentages of minority patients and have higher overall costs. This evidence goes to show that the gap and existence of health disparities will only continue to grow if these factors remain unaddressed.

While there are many factors to consider when discussing the root cause of health disparities, there are equally as many solutions that will aid in taking a step in the right direction and restoring health equity. Physician shortages, transportation challenges, and limited access to healthcare services are a few of the challenges Americans experiencing health disparities may experience. Since the pandemic, telehealth services have become extremely popular, convenient, and useful. Telehealth is an essential tool that can be used to reach people living in rural areas who face provider shortages and transportation difficulties.

The use of these services will allow residents in rural areas to access health care from the comfort and privacy of their own homes. It's also important to address the present issues and begin formulating a plan for change. For example, CMS is doing its part to improve the Medicare Shared Savings Program. This program has improved the delivery of high-quality care

in rural areas. “Shared Savings Program Accountable Care Organizations (ACOs) are groups of doctors, hospitals, and other healthcare providers collaborating to give coordinated, high-quality care to people with Medicare. The program’s goal is to ensure that people receive the right care at the right time, prioritizing their health while preventing medical errors and avoiding unnecessary and duplicative tests and treatments” (Seshamani et al., 2023).

Health prevention strategies are not discussed enough, and patients are often given information in the form of a pamphlet when visiting a doctor, not considering the education level, comprehension, and language barriers that may exist. Patient education is extremely important because it increases adherence to treatment plans, patient involvement, and overall, a healthier community.

Conclusion

By bringing specialized care closer to these patients, telemedicine helps diagnose, monitor, and manage CKD more effectively. This means better access to care and improved outcomes for rural CKD patients. However, more research is needed to fully understand telemedicine's long-term benefits and to address any technological challenges. Overall, integrating telemedicine into rural healthcare systems shows great promise in improving survival rates and quality of life for CKD patients in underserved areas.

Racial and ethnic disparities within healthcare are significant for numerous reasons. The blatant display of inequities within our healthcare system can cause an influx of ethical and moral dilemmas for both patients and employees. “Healthcare as a resource is tied to various notions of social justice, opportunity, and quality of life for our patients, our communities, and the nation at large. As a result, inadequate, inaccessible, and/or poor medical care further exacerbates increasing healthcare costs that have broad implications for the overall quality of

care experienced by all Americans” (Riley, 2012). Achieving health equity will promote fairness amongst other social constructs that our nation relies on and improve global health initiatives. This is a goal that requires the unified support of all healthcare workers, patients, stakeholders, policymakers, etc. No matter where one person may fall on that list, everyone has or at one point will need to access healthcare services. As an emerging healthcare administrator and professional, I will make it my fight to address health disparities in the communities I work in.

Healthcare administrators play a critical role in facilitating the implementation and impact of telemedicine on survival rates for patients with CKD in rural areas. According to a study by Nouri et al. (2020), healthcare administrators are responsible for developing strategies to integrate telemedicine into existing healthcare systems, particularly in underserved rural communities. They play a crucial role in overseeing the planning, implementation, and evaluation of telemedicine programs, ensuring that they align with organizational goals and meet the needs of CKD patients in rural areas (Nouri et al., 2020).

Administrators also play a key role in addressing logistical and operational challenges related to telemedicine adoption. According to Bashshur et al. (2016), healthcare administrators are responsible for coordinating various aspects of telemedicine implementation, including technology procurement, workflow redesign, staff training, and patient engagement strategies. They work to overcome barriers such as limited internet connectivity, provider resistance, and reimbursement issues, thereby facilitating the successful integration of telemedicine into rural healthcare delivery systems (Bashshur et al., 2016).

Healthcare administrators are instrumental in monitoring the impact of telemedicine on CKD outcomes and survival rates in rural areas. Through data collection and analysis, administrators can assess the effectiveness of telemedicine interventions in improving access to

care, enhancing patient outcomes, and reducing healthcare disparities. By leveraging evidence-based practices and continuous quality improvement processes, administrators can optimize telemedicine programs to maximize their impact on CKD survival rates in rural populations (Nouri et al., 2020; Bashshur et al., 2016).

In conclusion, healthcare administrators play a multifaceted role in implementing and impacting telemedicine on CKD survival rates in rural areas. Their responsibilities encompass strategic planning, operational management, and performance evaluation, all of which aim to ensure the successful integration of telemedicine into rural healthcare systems to benefit CKD patients.

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