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Increasing Access to Diabetic Self-Management Education Using Telehealth in Rural Kentucky

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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Walden University
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Abstract

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Kentucky

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MS, Eastern Kentucky University, 2001

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Project Submitted in Partial Fulfillment

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Doctor of Nursing Practice

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Abstract

The lack of diabetic self-management education (DSME) can affect generations of families who have suffered from diabetes. More than 80% of Appalachian Kentucky counties lack access to DSME and care due to high incidence of diabetes. The purpose of this quality improvement project was to determine whether the use of telehealth increased patient access to DSME in Southeast Kentucky. Application of Peplau's theory of interpersonal relations to patient relationships in nursing practice provided a framework for the project. De-identified retrospective data 6 weeks before intervention and 6 weeks postintervention were collected by the project facility for secondary data analysis to answer the practice-focused question. Post data were analyzed via percent difference analysis. Before intervention, there were four telehealth DSME visits. Postintervention, there were 30 visits. Results showed an 80% increase in the access to DSME using telehealth. Findings suggested that technology and tele nurse diabetes educators may be used to improve the lives of patients and their communities and to reduce costs to patients and facilities by avoiding hospital admissions and trips to the emergency room.

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Section 1: Nature of the Project

Diabetes is the seventh leading cause of death in Kentucky and the 14th in the United States (National Center for Health Statistics, 2014). The Centers for Disease Control and Prevention (CDC, 2021) reported an estimated 100 million Americans live with diabetes, with an additional 7.2 million Americans unaware that they have diabetes. More than 80% of Appalachian Kentucky counties lack access to diabetic education and care (U.S. Department of Health and Human Services, 2014). Disparities in access to health care, such as remote location, area-specific socioeconomic oppression, and restricted diet, contribute to the high rate of diabetes in Appalachia and many rural regions in the United States (Gutschall et al., 2018). The current project was significant for nursing because nurses advocate for educated patients to promote healthier lifestyles. Nurses not only provide care but also assist in treatments and participate in rehabilitation.

Nursing is broad and has far-reaching roles. More importantly, nurses have worked with patients and their families to help prevent heart disease and diabetes-related diseases. Diabetes mellitus (DM) can be detrimental to underserved populations, mainly when the quality of care and self-management are subpar, leading to heart disease, blindness, neuropathy, renal disease, and obesity (Office of Disease Prevention and Health Promotion, 2021). Educating and preventing disease progression in DM patient are goals of nursing practice. The purpose of this project was to evaluate the effectiveness of utilizing the existing telehealth program at a rural health clinic used for primary care services to provide diabetic self-management education (DSME).

Problem Statement

People with diabetes in rural communities need better access to DSME to prevent disease progression and complications (Giani & Laffel, 2016; Loveness et al., 2015; Petersen, 2014). DSME is a form of patient education in disease self-management knowledge, tools, and techniques to decrease symptoms, comorbidities, and adverse effects of diseases such as DM (Palmer, 2017). Baig et al. (2015) found that lack of DSME can affect generations of families with common disease literacy engrained in familial behavior systems, making DSME access in underserved areas critical. According to Sepers et al. (2015), the lack of access to chronic disease care and management, such as DSME programs, due to disparities in underserved areas directly impacts clinical outcomes in DM and comorbidity progression. Increasing access to DSME for residents of these underserved areas could benefit individuals and families and community health with lower rates of DM-related hospitalizations and mortality rates (Davis et al., 2019).

One strategy to address the problem of lack of DSME is the use of telehealth technologies. Telehealth, also referred to as telemedicine, uses technology to close the gap between health care facilities and remote locations using modes such as live videoconferencing and remote home monitoring (Telehealth Programs, 2019). Telehealth has improved diabetes outcomes through increased access to DSME (Davis et al., 2019; Powers et al., 2016). Telehealth offers an opportunity to provide remote access to DSME for diabetics, regardless of location, leading to improved DSME and improved outcomes. For example, Davis et al. (2019) demonstrated improved patient body mass index, blood pressure, lipid panels, and other essential DM indicators through their telehealth-

delivered DSME project conducted in an underserved community. Before improvements in diabetic outcomes could be assessed using telehealth, I first had to determine whether telehealth could increase access for patients to receive DSME in the rural Kentucky community. The practice-focused question addressed whether the use of telehealth in rural Kentucky increased access to DSME.

I evaluated the use of telehealth to deliver DSME-improved access for diabetic patients in rural Kentucky. DeVon et al. (2016) explained the mission of nursing science as a pursuit of advancement in academics, research, and practice. Accordingly, this project's premise of increased access to DSME using telehealth videoconferencing was significant for advancing evidence-based knowledge in patient-care initiatives to improve patient access to health care while addressing gaps in inadequate care.

Purpose Statement

The purpose of this project was to assess whether telehealth-delivered DSME using live telehealth communication could improve access to DSME. Currently, access to specialty chronic care services is limited due to the lack of patient access in the rural areas of Appalachian Kentucky. Increasing access to DSME utilizing telehealth videoconferencing with a qualified diabetic nurse educator (DNE) may address the gap in maintenance care techniques and education otherwise unavailable for DM patients in this region.

The project's purpose was to evaluate whether telehealth can increase patient access to DSME by comparing data before and after implementing a telehealth DSME program at the rural clinic. Patients who have experienced limited DSME may experience

improvement in their long-term health outcomes by connecting them with qualified health care personnel through telehealth communication. The practice-focused question addressed whether the use of telehealth communication increased patient access to DSME in Southeast Kentucky.

Nature of the Doctoral Project

The Appalachian Regional Commission reported that there are 420 counties in 13 states included in the Appalachian region of eastern United States, of which 78 counties are labeled distressed due to socioeconomic, obesity, physical activity, and diabetic factors (CDC, 2021). Results from this project may be used to increase efficacy in DSME for diabetic patients. Results may also be used to decrease hospitalizations for diabetic complications in rural areas while increasing access to specialized health care options via telehealth in rural Kentucky. Addressing access to diabetic care issues in Appalachian Kentucky may also benefit the community health of this region. The project aligned with the Walden University mission of social change by promoting health improvement and self-management measures for one of the leading morbidity factors in this region (Petersen, 2014; Walden University, 2018).

Project data were collected and documented by a qualified DNE at the project site clinic who directly participated in the DSME education via telehealth. Once data gathering was completed, the project team evaluated the findings. The approach used to complete this project was modeled after Peplau's (1992) theory of interpersonal relationships. The lack of access in practice addressed by this project consisted of limited

patient access to DSME, which created a gap in self-care and disease management education in people with diabetes in rural Kentucky.

Significance to Nursing Practice

Nursing professionals who practice in the clinics addressed in this project, current and future DM patients of these clinics, and local communities were stakeholders in this project. The impact of this project on these stakeholders has the potential to change practice procedures and offerings in these small communities through the expansion of DSME programs using telehealth modalities. According to the U.S. Bureau of Labor Statistics (2019), the largest workforce in the health care arena is nurse professionals, with most rural community care provided by nursing professionals (Barker et al., 2016).

In many smaller and rural communities, nursing professionals face challenges due to increased health care demands and decreased health care provider coverage, which has affected community health efforts and disease management efforts (Barker et al., 2016). Preventative, acute, and maintenance health care are often experienced by rural patients such as the participants in this project when referred or transferred to urban facilities (Harrison, 2019). Harrison (2019) added validity and credibility to this project for use in rural Kentucky by disseminating several evidence-based practice resources that narrowed the gap in health care through telehealth in rural communities. Advancement of DSME through telehealth videoconferencing for patients in rural regions who would otherwise not be afforded local access to such services may contribute to nursing practice advancement. The project reflected the mission of nursing science in practice advancements to meet the present health needs of patients in these regions. The project

findings have the potential for application in general practice using telehealth videoconference for these rural areas. This could effect positive social change in rural areas such as Appalachian Kentucky communities through increased access to qualified health care professionals and enhanced community health.

Summary

Everyone deserves competent and reliable health care, even those who choose to live in remote areas. The gap in access to care for patients in remote areas of Kentucky has left populations with a lack of health care services and health care education opportunities. This quality improvement project addressed the lack of DSME in remote regions of Kentucky, particularly Appalachian counties, where DM is one of the most prevalent conditions and is highly related to mortality rates and community health issues (National Center for Health Statistics, 2014). Evidence-based practice frameworks focusing on interpersonal relationships between nursing professionals and patients provided direction and support to this project. This quality improvement project addressed the following practice-focused question: Will telehealth communications increase patient access to DSME in southeast Kentucky? Section 2 provides a description of the project background, linking theory to a plan for intervention, and the parameters of the doctor of nursing practice (DNP) student and project team responsibilities.

Section 2: Background and Context

This project was conducted to narrow the gap in practice for an underserved

population by utilizing telehealth videoconference to provide DSME to diabetic patients

in a region with a history of little to no access to these services. Access to DSME

programs was a gap in practice in rural Appalachian Kentucky. A modality such as

telehealth patient care may increase access to quality patient care in these small

communities. Telehealth DSME programs could provide access to health care

professionals who would otherwise not be available to these populations. Addressing

access to diabetic care issues in Appalachian Kentucky may also benefit this region's

social/community health. Community health improvement and chronic disease self-

management efforts through increased access to DSME via telehealth modalities may

promote social change and enhanced community health in these underserved areas. In

this section, theoretical foundations, relevance to nursing practice, local background and

context, and the roles of the DNP student and project team are discussed.

Theory

Application of Peplau's (1992) theory of interpersonal relationships to rural

nursing utilizing telehealth technologies with success served as the foundation of this

project because this model encourages strong patient–provider relationships. Establishing

rapport is key to provider–patient interrelationships, which is difficult in an Appalachian

social culture where those not from that region are seen as outsiders. Connecting research

to practice, Peplau sought to preserve dignity and respect in patient–nurse relationships

by fostering interpersonal relationship foundations of patient care through the theory of

interpersonal relationships. Peplau found that patient illnesses and ailments provided an opportunity for this relationship by taking interpersonal situations and applying them directly to patient–nurse interactions to improve communication and understanding.

Peplau (1992) developed the middle-range theory of interpersonal relations as a conceptual framework to promote the personalization of professional nursing in patient–nurse communication and interaction. Peplau pursued the autonomy of nursing practice, which is reflected in this framework. Peplau further introduced orientation, working, and termination phases to the patient–nurse relationship as a structural paradigm to guide practice. Peplau applied these principles to patient–nurse relationships under various conditions using qualitative methods. Peplau's theory of interpersonal relationships demonstrates that familiarizing oneself with the patient's condition and their mental state gives the patient the opportunity to become comfortable with their provider and experience more success when compared to other, more impersonal care models. Senn (2013) used the phased paradigm to expand on the middle-range theory.

Senn (2013) advanced Peplau's work, developing a case study to demonstrate the efficacy of this framework in emergency department nursing. Using the phase paradigm set forth by Peplau, Senn found that this therapeutic and interpersonal structure facilitated positive outcomes in patient–nurse relationships and patient health, even under the duress of emergent conditions. Senn applied these findings to rural nursing dimensions, which involve patient health and cultural and social barriers due to isolation and self-reliance. Employing Peplau's findings, Senn was able to substantiate the validity of Peplau's framework. The findings of Peplau and Senn were supported through the works of

Rogers (1959, as cited in Quinn, 2012) concerning person-centered care, which has translated well with these frameworks. Rogers saw patient care as a directional process, similar to the work of Peplau and Senn, in meeting the patient where they are while providing direction and communication to facilitate positive change. Rogers's person-centered theory has been widely cross-applied, not only in health care and other helping professions but also in other highly competitive fields and training applications (Turner, 2017).

<center>**Relevance to Nursing Practice**</center>

Working directly from the model of interpersonal relations in nursing practice provided by Peplau's (1992) work, a patient–practitioner relationship was a primary objective in connecting patients to DSME through telehealth communication. The small, remote communities of Appalachia are often resistant to outsiders or nonresidents, particularly those who want to introduce change (Call et al., 2015). Senn (2013) found that expectations of rural patients valued generalist and specialist nursing care that could address broader care spectrums and concerns, such as that of advanced registered nurse practitioners and family nurse practitioners.

The groundwork laid by Peplau (1992) and furthered by Senn (2013) provided a theoretical framework to bridge the social divide between nursing professionals, or outsiders, and the Appalachian residents who composed the focus group population for the intervention. Previous efforts, such as mobile health units, had not been met with enthusiasm among rural Appalachian populations due to mistrust and misconceptions surrounding health care officials and professionals, as well as feelings of marginalization

and stigmatization (Abdoli et al., 2019). Tenets advanced by Rogers's (1959, as cited in Quinn, 2012) patient-centered approach in conjunction with the work of Peplau and Senn may provide positive implications for nursing practice in rural areas such as the project location in crossing cultural and social boundaries in the interest of improved DSME patient outcomes to decrease mistrust and misconceptions while also reducing marginalization and stigmatization effects.

The current state of nursing practice in this area has been known to depend on cultural perceptions and the acceptance of nursing professionals. Disparities in access to nursing professionals and practitioners remain a problem in Appalachia (Gutschall et al., 2018). Gutschall et al. (2018) cited the cultural ambiguity that defines Appalachian residents and explained that there is a traditional Appalachian culture that nursing professionals must respect to gain community acceptance.

With a lack of health care resources in Appalachian Kentucky, DSME programs are virtually nonexistent. These difficulties are also evident in persuading DM patients to adhere to prescribed care plans. Additionally, nursing practice in the region often involves the use of motivational interviewing to help patients see the importance of adhering to prescribed DM care plans and treatments (Carpenter et al., 2017).

Efforts in Kentucky have been met with limited success in prior years. The 2015 Kentucky Diabetes Report included updates on current and previous efforts to combat Kentucky's large proportion of diabetic residents through DSME and other preventative and maintenance care efforts (Commonwealth of Kentucky, 2015). Despite the promotion of a statewide Diabetes Prevention Program, Kentucky has been left with more than one

million residents in need of access to intervention measures (Commonwealth of Kentucky, 2015). Rural and remote communities suffer this disparity more than more centrally located areas of the state.

<div align="center">**Local Background and Context**</div>

People with diabetes deserve competent health care to survive. The Appalachian Regional Commission reported that there are 420 counties in 13 states included in the Appalachian region of eastern United States, of which 78 counties are labeled distressed due to socioeconomic, obesity, physical activity, and diabetic factors (CDC, 2021). Telehealth videoconferencing coupled with DSME could increase access to DSME in these small communities and provide opportunities for disseminating DSME that would otherwise not be available to these populations.

According to Giani and Laffel (2016), telehealth is the recommended intervention to counteract the challenges of rural living coupled with the lack of health care resources for Type 1 diabetic patients. Feltner et al. (2017) reported that Appalachian Kentucky counties (54 out of 120 counties) are considered part of the American diabetes belt. Health care options, particularly diabetic care, are nearing a crisis level in some of Kentucky's underserved and remote areas (U.S. Department of Health and Human Services, 2014). A 2017 study on diabetic self-care measures in Appalachian Kentucky indicated that of the 54 Appalachian Kentucky counties, more than 80% experience health care provider shortages and are currently underserved (Schoenberg et al., 2017; U.S. Department of Health and Human Services, 2014). Evidence showed definitive divergences in the availability of preventative diabetic care such as annual foot and eye

exams, proper vaccinations, and HbA1c testing at least biannually in the less affluent Kentucky counties of the Appalachian region (Sohn et al., 2016). According to evidence confirming the lack of help-seeking behaviors in non-Appalachian Kentucky and Appalachian Kentucky undergraduate students who constitute a demographic representation of Kentucky's overall population, Appalachian states must address the barriers presented by legislature and health care programs (Starcher et al., 2017). As a result of these findings and other aspects discovered about Appalachian culture, Starcher et al. (2017) also questioned how cultural barriers such as lack of health care options in these remote regions result in a lack of help-seeking behaviors shown in these populations.

Addressing access to diabetic care in Appalachian Kentucky may also benefit the community health of the region. The current project aligned with the Walden University mission of social change by promoting health improvement and self-management measures for one of the leading morbidity factors in this region (Petersen, 2014; Walden University, 2018). The project showed increased opportunity to access DSME for diabetic patients in rural areas such as Appalachia. Successful results could be applied in other rural communities to improve access to diabetic self-care management.

The Kentucky Telehealth Board provides statewide telehealth communication and practice parameters to create multidiscipline provider outreach opportunities, increasing access to otherwise underserved areas (Kentucky Boards and Commissions, 2019). Kentucky practice mandates follow the criteria set forth by the Centers for Medicare & Medicaid Services (2019), with recent updates to reimbursement rates and other

guidelines updated as recently as July 2019. In Kentucky, the Cabinet Privacy Program, Kentucky Health Benefit Exchange, and the Kentucky Health Information Exchange (KHIE) work in concert with other professionals to ensure Centers for Medicare & Medicaid Services and other federal regulations are followed explicitly regarding privacy, billing, reimbursement, and clinical care services (Telehealth Program, 2019). The influence of these organizations added integrity to the project.

Role of the DNP Student

My role as the DNP student included writing the proposal for the quality improvement project on how to increase access to DMSE to diabetic patients in rural Kentucky. The facility's method for providing DMSE was reviewed. I reviewed and analyzed peer-reviewed literature and related articles along with statistics of the occurrence of diabetes in Kentucky. I met with the clinics' manager and presented the proposal with supporting documentation for discussion. They agreed that the proposal was valid, and the project team was formed. Implementation of the project was expected to last 6 weeks. I oversaw the project and obtained the data collected and reported by the project team made up of practicing nursing professionals employed by the participating health facility. The team leader ensured uniformity and integrity related to the processing of data. I collaborated with the team leader during the project with no bias other than ensuring implementation and observing any electronic health record (EHR) software updating and personnel placement necessary to complete the project. Once the project exercises were completed, I analyzed the project data provided for the pre- and postintervention from the project facility to answer the project question.

My relationship with the participating health facility was attained through previous professional practice in the project region. No biases or preconceptions were held concerning the rural health clinic or its nursing professionals. Additionally, my work in the project region provided no negative feedback or other professionally or personally garnered influence regarding the rural health clinic or its nursing professionals.

Role of the Project Team

The project was conducted as a quality improvement project for underserved rural Kentucky communities. I evaluated whether using telehealth improves access to DSME to diabetic patients in this rural population. Data were collected using the services of a qualified DNE by the rural health clinic located in a rural Kentucky community. The project team consisted of a nurse practitioner, a DNE, and administrative and support staff. The DNE provided educational services and expertise in diabetes self-management with patients via telehealth teleconference. The nurse practitioner and support staff were available for patient assessments and diabetes management care, such as HbA1C testing, blood glucose testing, and blood pressure testing as necessitated by their care plan. Administrative and support staff were on hand to aid in data entry and resolution of telehealth hardware and software issues.

Summary

The lack of qualified health professionals and other barriers results in Appalachian Kentucky being underserved and deficient in health care services such as qualified DSME. Residents of the region often find themselves traveling long distances to receive such services if they opt to participate in such chronic care programs such as

DSME. I explored the feasibility of asserting the mission of nursing science to meet the current needs of patients through the application of evidence-based practice frameworks. Section 3 includes the project's practice-focused question, evidentiary support for the efficacy and necessity of the telehealth intervention to link DSME programs to underserved rural populations in Appalachian Kentucky, and an explanation of how the intervention was conducted.

Section 3: Collection and Analysis of Evidence

I explored the implementation of DSME via telehealth to increase access to such services in Appalachian Kentucky. Currently, the host clinic offers DSME in person and uses teleconferencing equipment and trained staff, which is used only for acute conditions. All patients with the diagnosis of DM were allowed to participate in the project. The staff involved in the project utilized the EHR system to generate a list of patients with the diagnosis of DM. The patients were asked if they would like to participate in a comparative study regarding telehealth to deliver DSME. Potential participants were instructed on how the study would be conducted and that for 6 weeks DSME would be offered via telehealth. Patients had the opportunity to become participants at that time. Once the final list of participants was compiled, each participant was given the opportunity to ask any questions about the project before signing a project participation authorization form.

Once the participants were determined, the participants' demographics were obtained using the secure file transfer via de-identified patient data. Because all DM patients are scheduled for DSME at the rural health clinic, participant's charts provided baseline data, including the number of encounters with the DNE. The DNE, as part of the project team, reviewed the participant's chart to conduct a retrospective review to obtain the number of patients who utilized the service and the number of encounters. Each participant was instructed on how to utilize the telehealth program by a member of the project team. Once the participant demonstrated understanding, telehealth appointments were scheduled with the diabetic educator. At the end of the 6 weeks, the DNE provided

the data for the report, which included the number of patients and the number of patient encounters for DSME. The project team compared the baseline data, or pre-data, which showed how many of the project participants had engaged in diabetic education, including their gender and age range, to the telehealth implementation postdata. The results of this project indicated that the implementation of DSME via telehealth improved access.

The lack of qualified DSME in rural regions of Kentucky, such as Appalachian counties, contributes to the perpetuation of the disease and its comorbid conditions. Only two-thirds of residents with DM in these areas test blood glucose levels daily, and the same percentage reported having receiving diabetes education, including how to plan meals and the importance of blood glucose monitoring (Feltner et al., 2017). Raffle et al. (2012) cited the high cost of DSME programs in rural areas such as Appalachia as a barrier to adequate coverage of qualified health care professionals to address this gap in services. Using Peplau's (1992) theory of interpersonal relationships to create rapport and acceptance of connecting to rural patients using telehealth videoconferencing, I conducted this project to answer the practice-focused question and provide evidentiary support for utilizing telehealth to increase access to DSME patients in rural areas such as that of the project population.

Procedures

The clinic utilized its existing telehealth program as a tool to collect data. Staff from the clinic gathered authorization forms from patients diagnosed with DM who chose to participate in the project. An additional tool that was used was the clinic's EHR

system. The clinic provided the DSME service via their telehealth program to provide access to DSME. The project staff collected postintervention data derived from the EHR. Once the project staff collected all data, they were then presented to the project team. For this project, existing measurement instruments were not applicable. No modifications were made to existing tools for this project.

<div align="center">**Protections**</div>

The procedures used to ensure ethical protection of the participants followed the Health Insurance Portability and Accountability Act guidelines, which protect patients' privacy. Data collected by the clinic staff were de-identified and provided to me for analysis and synthesis. The strategies used to recruit and develop working relationships with participants included clinic project staff utilizing the EHR database to access the patients diagnosed with DM. Project staff asked patients if they would like to participate. One hundred percent of eligible subjects had been determined and were allowed to participate in the project. Patients were then scheduled for their DSME visit via videoconference.

An institutional review board is responsible for reviewing research that includes collecting or analyzing data to ensure that the study meets the ethical standards set by an institution. The Walden University Institutional Review Board approved the project (04-27-21-0751290) using the criterion of inclusion and exclusion.

<div align="center">**Practice-Focused Question**</div>

Appalachian Kentuckians who live with DM face the problem of limited access or no access to qualified DSME programs throughout the region. Providing a way to

increase diabetic patients' access to DSME via telehealth was the goal of this project. The practice-focused question was the following: Will the use of telehealth communications increase patient access to DSME in Southeast Kentucky? The implementation of a telehealth DSME program was considered at the rural clinic. Limited resources to health care in the rural communities constituted a gap in needed education and specialized health care services. The gap in practice that this project addressed was the limited patient access to DSME, which created a gap in self-care management knowledge in people with diabetes in rural Kentucky. Limited access to DSME results in fractured efficacy in diabetic patient care. With minimal DSME access in the rural clinic where the project data were collected and evaluated, deficient self-management practices perpetuated current disease states in this population of patients (Giani & Laffel, 2016; Loveness et al., 2015; Petersen, 2014). I assessed whether telehealth-delivered DSME could improve access to DSME among DM patients in this underserved area.

Survey data collected by the host facility in 2019 indicated that 74% of patients missed their in-person DSME appointments due to lack of a working automobile and money to pay travel expenses. Therefore, the objective of this project was to investigate whether providing DSME by a DNE via telehealth videoconferencing would improve access to DSME. Telehealth technologies can eliminate barriers to access due to geographic distance and provide needed DSME remotely, decreasing barriers to care.

Sources of Evidence

The evidence-based practice provided a foundational basis for this project through peer-reviewed documentation. I examined similar and supporting studies to determine

whether telehealth videoconference utilization would alleviate the shortage of DSME in Appalachian Kentucky. Evidence-based practice indicated that rural Kentucky is underserved, suffering from disparities in diabetes care and DSME programs, providers, and qualified nursing professionals to deliver these services. Telehealth provided a practical way of reaching these remote areas without an influx of provider care facilities to the region.

Evidence to support this project was obtained via keyword searches from MeSH, MEDLINE (PubMed), EMBASE, Ovid, Scopus, Welch Medical Library, PDR.net, ClinicalTrials.gov, Healthline, MedConnect, Medscape, and Cochrane Central. Search terms included *diabetes*, *diabetes* and *telehealth*, *diabetes* and *telemedicine*, *diabetes self-care management* and *DSME*, *remote diabetes care*, *rural Kentucky diabetes*, and *rural telehealth*. Professional organizations' evidence and practice guidelines included the American Diabetes Association, American Telehealth Association, MidAtlantic Telehealth Resource Center, DiabetesEducator.org, and Lippincott Nursing Center.

In reviewing materials that supported the need for further research to benefit the people of rural Kentucky, I focused on telehealth DSME interventions in diabetic residents. Feltner et al. (2017) reported that Kentucky counties in the Appalachian region (54 out of 120 counties) are considered part of the American diabetes belt related to the region's exceptionally high rates of DM diagnosis due to obesity and physical inactivity. Mclendon (2017) found that patients with access to diabetic care via telehealth had improved patient care in several areas, the most prominent being continuity in access to care.

Evidence showed definitive divergences in the availability of preventative diabetic care such as annual foot exams, annual eye exams, proper vaccinations, and HbA1c testing at least biannually in the less affluent Kentucky counties of the Appalachian region (Sohn et al., 2016). Increased access to education via telehealth promotes health-care-provider-endorsed social programs and policies while advocating help-seeking behaviors in this population (Santilli & Vogenberg, 2015). In reviewing supporting literature and evidence-based practices, I discovered that the concept of using telehealth modalities to expand health care services and accessibility was not novel. However, patient education had traditionally been used in hospital settings (Nesbitt, 2012). Although traditional patient education is valuable, telehealth education may increase access to specialty patient education programs such as DSME in underserved areas where comorbidities and morbidity rates are high due to lack of adequate services.

When reviewing supportive evidence of telehealth DSME in rural Kentucky areas such as the Appalachian regions, Winters and Lee (2010) offered that rural residents exhibit commonalities in the symptom-to-action timeline in health-seeking mannerisms. Winters and Lee found that symptom identification, self-care, lay resources, and professional resources are the general stages evident in rural residents' health-seeking decisions. Self-care, or using nonprescribed treatments and medications to alleviate symptoms, is especially prevalent in rural areas. Many residents also use nonmedicinal, herbal, traditional, and folk remedies with no empirical basis for efficacy or safety (Winters & Lee, 2010). This practice is solidified in the general mistrust of outsiders in these regions, corresponding to residents' postponement in seeking health care.

Underserved areas such as Appalachian Kentucky have long suffered the effects of their remote locations. Speyer et al. (2018) looked at the effects of utilizing telehealth in place of standard patient interactions, or face-to-face office visits, using allied health services in unspecified rural populations to provide physical, cognitive, and emotional treatments. Speyer et al. found telehealth to be a viable alternative to patients of these target populations traveling to metropolitan areas for similar care services. Individual and community acceptance of the researchers were among the primary barriers to their work (Speyer et al., 2018). Speyer et al. also reported that reduced health care costs, less time away from their workplace, and reduced travel time for practitioners and residents of these populations provided promising benefits of telehealth interventions in these areas.

Barker et al. (2016) provided further support for telehealth intervention to increase DSME availability in West Virginia's Appalachian region. Qualified nursing professionals were used to provide telehealth care in these regions, which proved effective in addressing DSME subject areas and fielding patient questions (Barker et al., 2016). Using a nurse practitioner to observe the eight participants who completed the study, Barker et al. found that only 20% of participants had participated in any level of DSME though they had been diagnosed with DM an average of 7.5 years each. Though the small sample size was a limitation for this study, findings demonstrated the disparity of DSME programs in rural areas, particularly Appalachian areas.

Additional support for utilizing telehealth DSME interventions in the Appalachian Kentucky regions was found in a study that addressed DM care trends and disease management in West Virginia. Misra and Sambamoorthi (2019) measured baseline

HbA1c results in primarily White obese participants in a control group receiving no intervention and a treatment group receiving DSME and other DM care through a participating provider, adjusting for confounding variables such as demographics, lifestyle, and access to care. Misra and Sambamoorthi found that within 5 years, those receiving the intervention of DM care and self-management education increased the likelihood of submitting to at least some level of HbA1c testing increased by 78% . Overall clinical care ratios for the entirety of participants rose by nearly 13%, though self-exams, foot care, and annual vision exams either remained static or decreased in frequency (Misra & Sambamoorthi). According to Misra and Sambamoorthi, DSME is among the primary objectives for this Appalachian area and many other rural areas. Less than half of residents reported receiving any formal DSME since receiving their DM diagnosis.

Rural areas often experience higher rates of chronic DM disease diagnoses, comorbidities, and morbidity reported annually per capita (Lepard et al., 2015). Lepard et al. (2015) reviewed 15 studies addressing the efficacy of telehealth interventions in increasing rural DSME programs. The primary purpose of their review was to demonstrate improved metabolic and self-efficacy outcomes by increasing DSME in rural populations utilizing telehealth to bridge the distance between educators, providers, and patients. Interestingly, one third of the studies reviewed included telehealth-delivered specialized behavior therapy techniques modeled around social cognitive and motivational interviewing frameworks as part of the program parameters. Significant improvements in body weight, blood pressure, HbA1c, and diabetes knowledge using

telehealth interventions with DSME were reported as an overall result in this review.

Face-to-face interventions, which were used in some of the reviewed studies as a vehicle

for comparison, indicated similar effectiveness. The results of this systematic review

indicated that telehealth DSME interventions in rural areas are an effective system to

reach individuals in remote areas who may otherwise not visit their health care

professionals regularly or as needed.

However, the use of Telehealth services does not come without other

considerations. According to the American Medical Association (2018), providers must

uphold obligations to patients, such as disclosing whether they have a financial interest in

providing telehealth services. Providers must provide information in websites or other

mobile platforms regarding published health information that is accurate. In addition,

providers must ensure that appropriate protocols are carried out to prevent the loss of

integrity of patient data throughout the patient encounter process. The provider must

educate the patient regarding the limitations of services, describe the provider–patient

relationship, review means of follow-up care, and instruct the patient to notify their

primary care provider if the provider was offering telehealth services to the primary care

provider to promote continuity care. Another challenge of providing telehealth services

was noted by Barker et al. (2016), who stated that frequent calls to the patient that are

lengthy can hinder instruction. Given that diabetes is a chronic disease that can affect

multiple body systems, a vast amount of information is needed to manage the illness.

Home-based telehealth services can be challenging due to patient acceptance. The

patient's ability to navigate telehealth system programs and the use of various devices to

obtain services are a couple of barriers documented by (Board on Health Care Services; Institute of Medicine, 2012). Patient privacy is another issue. Some may not be receptive to telehealth and view it as an intrusion of privacy. Policies must be put into place and adhered to at all times to promote safety and security with service.

Management of the data obtained must also be considered to be actionable according to (Board on Health Care Services; Institute of Medicine, 2012). Since many providers in rural areas do not have disease management teams, a plan to synthesize the data after compilation must be put in place before the onset of patient data collection. Honey and Wright (2018) noted nurse's consideration regarding the use of telehealth services, as they are often supporting staff for the provider and patient. Themes included the need for education, preparation, and nursing competencies. Again, the telehealth program must have clear and thorough policies and procedures before implementation. Among management of patient data collected, provider buy-in and patient perspective must also be considered.

According to Call et al. (2015), provider buy-in is one cited reason for the slow adoption of telehealth services. Adequate resources and education must be available to facilitate buy-in by meshing the use of telehealth into daily activities. Proper equipment, training, support services, and internet services are a must for a successful program. The patient perspective, on the other hand, as presented by Call et al. (2015) through the Montana Health Matters study, determined the significant percentages like 23% of participants saw comfortability if could be convenient, 29% situationally but uncomfortable, and 43% unequivocally averse despite inconvenience to in-person

services. However, advantages were observed, such as reduced travel and costs, but surveyed reflected issues equitably to in-person care. Barriers exist in providing DSME via telehealth services. Nonetheless, through further exploration to resolve obstacles and guidance from professional diabetes organizations, a successful program could be achieved.

In a joint statement from the American Diabetes Association (ADA), the Academy of Nutrition and Dietetics (AND), and the American Association of Diabetes Educators (AADE), Powers et al. (2016) report that comprehensive DSME for those diagnosed with DM is the foundation of maintaining a level of health consistent with their standards successfully. An evidence-based diabetes education algorithm using coordinated care paradigm that encompasses behavioral support, information sharing, and patient engagement as three critical standards of care (Powers et al., 2016). The algorithm of care standards relies upon patient-centered care principles, as forwarded by Carl Rogers, in engaging patients through active/reflective listening, motivational interviewing, and support for self-efficacy efforts (Powers et al., 2016). According to Powers et al. (2016), DM and any comorbidities should be approached holistically to promote whole-patient care and alleviate stressors and anxiety so that patients can focus on positive health outcomes. Medical nutrition therapy (MNT) is another critical aspect that serves as an adjunct to DSME and is most effective when included in a coordinated care plan that includes provider care, DSME, and MNT as a comprehensive treatment approach (Powers et al., 2016). In the rural communities of Appalachian Kentucky, there is currently very little or no access to such comprehensive treatment.

A 2-year clustered, randomized clinical trial from Zgibor et al. (2018) using the Designing MEDication Intensification Effectiveness Study for Diabetes (REMEDIES 4D) intervention framework revealed improved DM-related health outcomes in utilizing certified diabetic educators (CDE) treatment protocols in direct support of the comprehensive care plan. Zgibor et al. (2018) report that CDE utilization in primary care settings promotes HbA1c, LDLc, and blood pressure reduction in patients receiving this comprehensive care as part of their DSME program. Incidentally, Zgibor et al. (2018) also note that clinical and financial concerns of patients with diabetes may be improved as well with CDE/DNE health professionals.

The knowledge and skills of CDEs aid in improved patient health outcomes for those diagnosed with diabetes. DNEs, analogous with CDEs in a professional capacity, tailor DSME program plans to fit the patient's individual, social, cultural, economic, physical, and other needs to enhance health outcomes and disease maintenance (Burke et al., 2014). The CDE/DNE focus is the direct DM and DMSE care of the individual and, as needed, their families and caregivers (Burke et al., 2014). Incidentally, Burke et al. (2014) determine that normalizing the use of CDE/DNE-led DSME programs utilizing telehealth modalities is a natural progression from traditional means of DSME program delivery.

Achieving a modicum of evidence in the efficacy of telehealth modalities in increasing access to DSME programs in the underserved area of Appalachian Kentucky is supported in the sources mentioned above. Collection and analysis of this data will be provided evidence as to the adequacy of this intervention with DSME programs and has

potential implications for other forms of telehealthcare, as witnessed in these sources. Normalization of telehealth utilization to this region will open opportunities for care services that residents have not traditionally accessed.

Analysis and Synthesis

This project addresses disparity created by lack of access to qualified DSME programs in rural Appalachian Kentucky through telehealth communications to deliver DSME in a rural Kentucky population utilizing patients currently diagnosed with DM at a rural health care practice by a qualified Diabetic Nurse Educator (DNE). The data was derived from the clinic DM patient population receiving the telehealth intervention. The project team compared Pre-intervention data and post-intervention data.

The clinic has utilized an existing DSME Diabetic Nurse Educator (DNE) onsite. The addition of telehealth-delivered DSME gave access to these patients, helping them receive DSME. The clinic collected and recorded project data, including pre-and post-intervention data, in a uniform format to retain integrity in analysis for reporting after project completion. The data contained the 6-week retrospective data collected before implementing the project intervention of telehealth DSME access and the 6-week post-intervention collection of data for DM project patients. The project team provided this DNP student with all collected data at the end of the project.

The clinic's electronic health records (EHR) system provided both pre-and post-intervention data for the DM patient population. The data was obtained through secure file transfer in de-identified summarizations of patient data throughout the intervention period. The recording standards are in line with the parameters necessary for ensuring

data integrity for this project. All personnel responsible for data input are trained to follow software, hardware, and health care policy/regulation protocols. This DNP student received this data from trusted project team members to begin analyses.

Pre-intervention data was obtained by the project team for the six weeks of August through mid-September 2020 to establish baseline DSME participation rates before the institution of telehealth videoconferencing with the DSME patient-participants. De-identified demographic data and participation/attendance data were gathered using EHR data pre-and post-intervention. Data was analyzed using Statistical Package for Social Sciences (SPSS) software, including descriptive statistics via percentage differentiation. The project aimed to determine whether the addition of diabetic self-care management education through telehealth would increase access to care for diabetic patients.

Throughout the project, the clinic provided EHR software. System updates were kept current with the latest EHR and security software upgrades available to ensure the soundness of systems being utilized in data recording and reporting of this telehealth DSME project. Additionally, any missing data (due to withdrawals from the project) was managed using the listwise or case deletion approach compatible with SPSS statistical software capabilities. This project was conducted as a quality improvement project for underserved rural Kentucky communities.

The project team consisted of nurse practitioners, administrative and support staff. The DSME Diabetic Nurse Educator (DNE) onsite shared expertise in diabetes self-management with patients of clinic attending appointments via telehealth teleconference.

This project was conducted using data collected using the services of a qualified DNE by a rural health clinic located in a rural Kentucky community, with direct participation by DM patients who received DSME through telehealth video. Nurse practitioners and nursing professionals from the clinic were available for patient assessments and diabetes management care, such as HbA1C testing, blood glucose testing, and blood pressure testing as necessitated by their care plan. Administrative and support staff were on hand to aid in data entry and resolution of telehealth hardware and software issues.

Telehealth training in video communication protocols in line with Health Insurance Portability and Accountability Act standards are key factors in implementation. Patient data utilized in this project provided results throughout the intervention that was measured quantifiably regarding intervention patients receiving DSME via telehealth video communication every week. De-identified data provided by the clinic regarding increased access to DSME provided data to answer the project question. The clinic provided DSME access via telehealth video communication by their DNE with participants diagnosed with DM and residing in a rural area of Kentucky, thereby increasing access to DSME to patients.

<div align="center">**Summary**</div>

This section has explored the practice-focused question regarding the efficacy of telehealth teleconference in increasing access to DSME in Appalachian Kentucky and the substantiating evidence, and how data will be analyzed and synthesized for consumption. Observance of theoretical models and frameworks used as the foundation and guideposts for this project was critical to assure evidence-based practice procedures. Meticulous

attention to detail and precision, in addition to the integrity of the clinic personnel and the

DNP student, in data collection, analysis, and cross-comparisons, and reporting, are vital

to the success of this project. The DNP shall remain aware of any changes in health care

policies and emerging evidence-based practice findings to assure the validity and

credibility of this project. Section 4 explored the culmination of these elements in a

project based on a diabetes mellitus disease self-management program via telehealth with

a diabetes nurse educator over six weeks.

Section 4: Findings and Recommendations

Evaluation of whether telehealth modalities can be used to increase patient access to DSME was explored in this project. In the Appalachian region of the eastern United States, 78 counties are labeled distressed due to factors such as obesity and diabetes (CDC, 2021). Considering the burden these factors place on health care in rural areas, stakeholders must engage in standards that promote accountability and beneficence. Before completing this quality improvement project, I believed that offering diabetic education via telehealth would increase access to care. The purpose of this project was to explore whether telehealth delivered DSME using live telehealth communication could improve access to self-management education.

An organizational meeting was held with staff involved in the project from the rural hosting clinic. Evidence-based practice frameworks focusing on interpersonal relationships between nursing professionals and patients provided direction and support. The project team held the meeting to discuss diabetic education access to patients in the local area. I presented the proposal for the project. The best ideas for the implementation of telehealth services for diabetic education were reviewed by the team. The diabetic educator presented her teaching plan to the team and expressed her experience with in-person onsite patient visits. Once her presentation concluded, the team determined that there would be 6 weeks allotted for the project, including data gathering and education provided to the participants via telehealth. After the project, pre- and postimplementation data were compared to determine whether telehealth-delivered DSME using telehealth communication improved access to self-management education. The pre- and

postimplementation data revealed four preimplementation encounters and 30

postimplementation encounters, with an increase of 80% in the encounters in the access

to DSME using telehealth.

Findings and Implications

The problem of lack of access to appropriate health care for rural residents in

Appalachian Kentucky must be prioritized. Everyone should have competent and reliable

care even if they choose to reside in remote areas of the state. DM is one of the most

prevalent disease processes related to mortality rates (National Center for Health

Statistics, 2014). This quality improvement project addressed the practice problem of the

lack of access to specialized health care education among rural residents in Appalachian

Kentucky. Data were obtained to assess the occurrence of DM in the rural area of

Appalachian Kentucky. The use of readily available technology provided the opportunity

to fill a health care gap. The hosting clinic for the project wanted to assess whether

utilizing their existing telehealth services to provide DSME to their patients by a DNE

would improve access to a second clinic.

The team involved in this project consisted of five members. Appendix A

includes the timeline for the project and a breakdown of team members. The project team

at the site included a family nurse practitioner, a registered nurse, a DNE, an office

manager, and a clerk/records attendant. The clinic nurse practitioner was the program

participant who functioned as the telehealth diabetes educator. De-identified retrospective

data 6 weeks prior to and 6 weeks postintervention indicating the number of diabetes

education telehealth visits were given to me by the facility via the secure file transfer to

be used in secondary data analysis. After the records clerk scheduled the appointments, the diabetic nurse practitioner educator provided the participant with education on diabetes. The project intervention occurred for 6 weeks. Figure 1 illustrates pre- and postencounters among the participants.

Pre-intervention data were collected for 6 weeks, followed by telehealth for 6 weeks. Data were then compared. Findings indicated that there were four visits preintervention. After 6 weeks, postintervention data indicated a total of 30 encounters (see Appendix B). Pre-post analysis of percent difference revealed that the program had increased access by 80% (see Figure 1). Results of this project indicated that telehealth increased access to DSME education.

Figure 1

Pre- and Postencounters
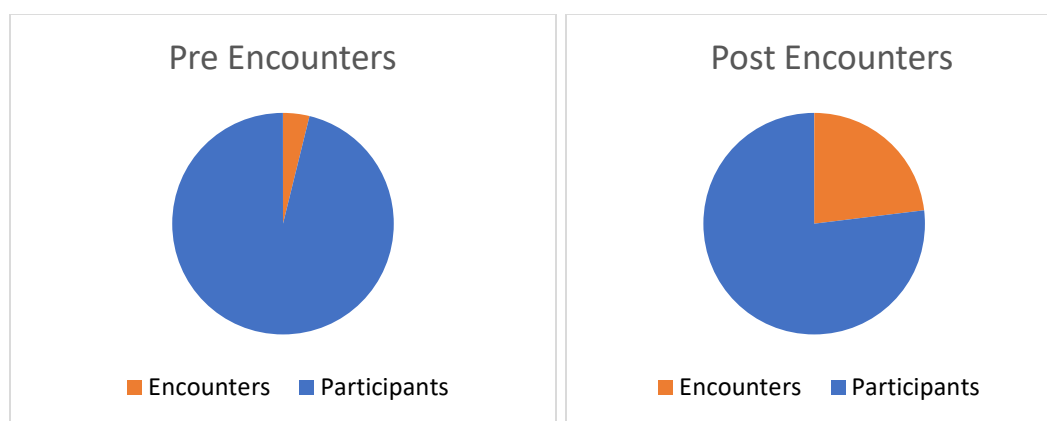
Implications of this quality improvement project are that patients and health care professionals can utilize telehealth communications to broaden the scope and expand the perimeters of services by offering another mode of health care access and delivery. The ability to provide DSME via telehealth to patients with DM in rural Kentucky could be

substantial considering that populations in 80% of the Appalachian counties suffer from diabetes and poor disease management. The utilization of live telehealth communication in diabetes management could be cost-effective and could improve disease management.

Recommendations

It is recommended that all established patients be scheduled visits for DSME as recommended by the American Diabetes Association and DiabetesEducator.org and the health care provider's standards of practice related to care plans for patients diagnosed with DM. The rural clinic is fortunate to have access to a DNE who is a community resident and has been teaching DSME for many years. The recommendation for this rural clinic is to continue to schedule patient encounters via telehealth when onsite is not an option for the patient or if the patient cannot make it in for a visit.

Contribution of the Doctoral Project Team

The goal of this project was to determine whether access to DSME would be increased through the use of telehealth. Diabetes self-management is important in the treatment of diabetic patients. The care of patients with DM has now been expanded due to this project. DSME will now be provided in-person onsite, but also via telehealth, which can provide much-needed access. The project team in Southeast Kentucky was instrumental in the implementation of this DNP project. The team included a family nurse practitioner, a registered nurse, a DNE, an office manager, and a clerk/records attendant. The project team worked well together and was very organized. The vast knowledge of the project team was impressive to their patients and to me as well. Nurses continue to

address health issues and look for feasible solutions to help close the gap in access-to-

care problems.

Strengths and Limitations of the Project

The strengths of this project were the educational background of the DNE and the

dedication of the project team. They seemed genuinely invested in their community and

their patients. The project team members worked well with each other and demonstrated

a professional work environment. Several team members facilitated a holistic approach to

patient care by encouraging patients to have family members call with questions when

needing clarification with glucose monitoring, testing, logging readings, foot care, and so

on. The DNE was engaging with her approach in DSME. I understand that as a scholar, it

is important to share experience and knowledge gained to facilitate others in future

projects. Growth is stimulated and can spur other projects that peers may be interested in

exploring.

Limitations in this project included the short time frame. A more extended period

would have provided a better indication of compliance with the care plan and the need for

follow-up visits related to new issues related to DM. Also, a larger number of participants

would have been preferable. The small sample size may not have been representative of

the rural community. This project was specific to one rural clinic and its staff, and

findings may not be generalizable other rural clinics in the area.

Recommendations for Future Projects

Recommendations for future projects include contacting other rural clinics

regarding setting up possible projects similar to this one. Another recommendation is

hosting a seminar with regional leaders in surrounding communities to discuss other

health disparities and issues. Collaboration with other providers in this rural community

could lead to more assessment, more DSME, and increased access for patients.

Section 5: Dissemination Plan

As a doctorate-prepared nurse practitioner, I must share the results of my project with my peers. My goal is to contact other small rural clinics in the community to see how we can work together to combat the increasing disparities among DM patients. I will provide a well-formatted presentation of the findings from this project to my peers and answer any questions about the conclusions. This project can be utilized as a model to demonstrate how local clinics in rural areas can work together in small communities to solve everyday problems. Dissemination of scholarly projects and conclusions is expected of the DNP nurse to communicate with peers and provide essential learning opportunities for academic communities. As a member of the Kentucky Coalition for Nurse Practitioners and Nurse Midwives, I see the importance of attending conferences with poster presentations and guest speaker presentations to disseminate my findings. Peer-reviewed publications are another meaningful avenue for dissemination. Worth noting is that the project team involved in implementing this quality improvement project is willing to mentor others interested in pursuing a similar service for their DM patients.

Analysis of Self

I have grown as a scholar, nurse practitioner, and project manager. During this project, the U.S. health care system was pushed at times beyond its limits. So much loss occurred during this period, yet so much compassion was expressed. While pushing forward to complete my program, I became a better communicator, listener, and leader. A change agent is what I want to be, one who strives to find solutions to the problems that affect many people in one way or another. Reaching my goal of having a doctoral degree

enables me to expand my research opportunities and look for ways to find solutions to some of the nation's health care issues.

Through this DNP project, I have become a scholar by increasing and expanding my knowledge base. I have learned to research and review studies in a manner that will allow me to share information with others in my field. While reflecting on the quality improvement project, I discovered how important it is to communicate and disseminate findings in a way that can be meaningful to others. Learning to speak with a scholarly voice takes time and perseverance. The DNP program at Walden University has provided me with guidance and educational tools to conduct future projects successfully.

As a nurse practitioner, I have met one of my professional goals of diversifying my credentials to a doctorally prepared nurse practitioner. I believe that broadening my education may lead to increased quality of care and safety for patients. The DNP affords me additional training to play a more significant role in transforming health care delivery systems.

My role as project manager has enhanced my management and critical thinking skills. The role of project manager provided me with the task of overseeing that the project was carried out in a timely and efficient manner. I checked with project team members weekly to ensure assignments were completed within planned deadlines. Meetings were held to identify any issues throughout the project. This quality improvement project has given me the insight to be able to achieve advanced organizational goals.

Summary

Telehealth can provide patients with access to DSME. The purpose of this project was to explore whether telehealth-delivered DSME using live telehealth communication can improve access to self-management education. The problem was that access to specialized chronic care services is limited due to the lack of patient access in the rural areas of Appalachian Kentucky. Through increased DSME access through telehealth communication, patients who have experienced limited DSME may experience long-term improvements in their health outcomes. The results of 30 DSME visit encounters for 15 clinic participants with DM diagnosis indicated that patients will engage in the service provided by a diabetic educator via telehealth. In addition to 100% participation among the project sample, 13 participants engaged in multiple encounters over the 6 weeks. This clinic sees telehealth DSME as a positive way to counter missed visits by patients with DM. Awareness regarding multiple ways to utilize telehealth services has been realized. Preventive maintenance and diabetes management may be vital to promoting a healthier life with the disease.

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Appendix A: Project Timeline

Duties	Members Engaged	Duty Timeline	Member Responsible	Result
1.Team meetings and implementation plan reviewed	-Family Nurse Practitioner -Registered Nurse -Diabetic Educator/Team leader -Office Manager Records/Clerk	Week 1	Team Leader	Planning and organizing for implementation
2. Invite all patients with Diabetes Mellitus to participate in the quality improvement initiative	-Family Nurse Practitioner -Office Manager - Records/Clerk	Week 2	Team Leader	List of participants Scheduling.
3. Review of plan and instructions provided to participants on telehealth equipment and appointments scheduled	Diabetic educator -Registered Nurse -Records/Clerk	Weeks 3-4	Team Leader	Instructions on telehealth program provided and implementation of diabetic education visit encounters.
4.Telehealth Diabetic education	Diabetic educator	Week 5-6	Team Leader	Finish up with remaining Diabetic Education visit encounters
5. Evaluation of the implementation of diabetic Education via Telehealth	-Family Nurse Practitioner -Registered Nurse -Diabetic Educator -Office Manager -Records/Clerk	Week 6	Project Team	Assessment and Evaluation of Implementation of Diabetes Education via Telehealth Outcome

Appendix B: Pre- and Postimplementation Comparison

	Total number of encounters
Pre	**4**
Post	**30**