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Using telehealth for diabetes self-management in underserved populations

Abstract: Diabetes self-management is a complex process and central to well-being of patients with this chronic disorder. A patient-centered telehealth program may potentially meet needs of those in underserved populations to reduce socioeconomic disparities. Achieving this goal requires a focused concentration on health behaviors and practices of individuals in underserved populations.

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Advancements in information technologies have introduced innovative telehealth interventions, which are useful and acceptable for diabetes self-management education and support (DSMES) for patients and providers.¹ Telehealth is the use of electronic information and telecommunication technologies to support and promote long-distance clinical healthcare and patient education.² Before designing a telehealth program, NPs should first determine patients' needs. This article will assess the feasibility of using telehealth in low-socioeconomic status (LSES) populations for diabetes self-management. With an understanding of the health behaviors and practices of those in LSES populations, telehealth programs may offer solutions to reduce disparity in diabetes care by increasing access and education.

Diabetes affects about 34.2 million people in the US or 10.5% of the US population.³ In the last 20 years, the number of adults diagnosed with diabetes has more than doubled.⁴ The prevalence of diabetes has increased among LSES populations.⁵ These populations are often underinsured or uninsured and reside in medically underserved areas where they can face economic, cultural, and/or linguistic barriers that lead to a shortage of healthcare services.⁶ With high rates of poverty and reduced access to care, these groups are also at a higher

risk for diabetes complications and poor health outcomes.

Recently, diabetes became a national priority when it was identified as the seventh-leading cause of death in the US.⁴ Studies have shown that those with low levels of education and low income have increased susceptibility to developing diabetes-related complications and mortality due to obesity, poor glycemic control, reduced access to care, underinsured or uninsured status, and failure to adhere to other complex diabetes self-management tasks.^{3,7,8} Support systems should also be considered as valuable contributors to patients' psychosocial well-being when dealing with the stressors associated with the chronic nature of diabetes. Because access to care and self-management abilities are key components to the outcomes of diabetes, LSES may play a significant role in the disease management process.⁸

■ Review of the literature

The literature search aimed to identify articles that discuss diabetes and self-management behaviors among LSES populations. The following databases were searched: Scopus and Ovid MEDLINE with the use of Medical Subject Headings (MeSH). The keywords used for searching "diabetes" included: *diabetes mellitus*; *diabetes mellitus, type 1*; and *diabetes*

Keywords: advanced registered nurse practitioners (ARNPs), independent contractors, Medicaid, Medicare, payment parity, practice owners, private insurance, reimbursement

mellitus, type 2. Keywords used for searching “self-management behaviors” included: *self-management*; *self-monitoring*; *self-care*; and *behaviors*. Keywords used for searching “low socioeconomic status” included: *low-income*; *low socioeconomic*; *poverty*; *indigent*; *impoverished*; *underinsured*; *uninsured*; and *underserved*. The search looked for the occurrence of these terms in the article title, abstract, or keywords for each list. The search results were then combined into one search. The literature search identified 273 results in Scopus and 113 articles in Ovid MEDLINE. The following inclusion criteria were



People with low levels of education and low income have increased susceptibility to developing diabetes-related complications and mortality.

used to determine eligibility: 1) participants aged 18 or older with type 1 or type 2 diabetes mellitus; 2) participants from underserved, low-income, or low-socioeconomic groups in the US; 3) discussion of diabetes self-management or diabetes management behaviors. Articles that did not focus on a low-income or low-socioeconomic group in the US were excluded. Studies completed in countries other than the US were excluded. Articles covering gestational diabetes were excluded.

Review of the studies followed guidelines to assess rigor.⁹ Study design was evaluated, including sampling methods; biases and threats to validity; reliability and validity of the data; mentions of attrition; narrative descriptions in qualitative studies; and description of the methods, interventions, and findings.⁹

■ Results

Eleven studies met inclusion criteria and had an adequate design. These articles examined diabetes self-management behaviors or perceptions among LSES populations. Two of the studies were cross-sectional descriptive quantitative studies.^{10,11} One study was a quantitative study from a sample that was part of another larger randomized study.¹² One was a qualitative study from a randomized controlled pilot study.¹³ Another study used a quantitative randomized pretest/posttest control group design.¹⁴ Two were qualitative studies that used a grounded theory approach.^{8,15} Four used qualitative studies with a phenomenologic

approach.^{16,17,18,19} Sample size varied from 10 to 84 in the qualitative studies and from 83 to 314 in the quantitative studies.

The studies were implemented in primary care clinics, university-affiliated health clinics, local community clinics, and hospitals in both rural and urban areas of states spread throughout all the different regions of the US from California, Illinois, Iowa, Kentucky, Maryland, Michigan, North Carolina, Ohio, Tennessee, and Texas. The populations studied in the articles were diverse, including nine examining Hispanics or Latinos,^{10-15,17-19} seven evaluating Black Americans,^{8,10,11,15,16,18,19} four examining White Americans,^{8,11,18,19} as well as two investigating or including Native Americans,^{18,19} and two including other races in the study samples.^{11,18} Participants' ages ranged from 25 to 86 years old with an average age of approximately 57 years old. Study

participants were from LSES populations with low income who were unemployed, uninsured or underinsured, or met financial eligibility for assistance.

Seven studies examined self-care behaviors for medication management.^{8,11,13,15,16,18,19} Five evaluated self-monitoring and management of blood glucose levels.^{8,10,14,16,19} Eight articles discussed dietary aspects of diabetes management.^{8,10,11,15-19} Seven studied exercise or weight management behaviors.^{8,10,11,15-17,19} Six reported on psychosocial barriers related to diabetes self-management.^{10,12,15,17-19} All studies focused on low-income and underserved populations in the US. This review covered a range of methods, including the use of in-depth focus groups, face-to-face interviews, telephone interviews and surveys, and medical records abstraction. This allowed for a comprehensive interpretation of findings, which is important in qualitative studies.

■ Synthesis of the literature

Many participants described difficulty keeping up with appointments and carrying out preventive measures such as foot and eye examinations. According to two studies, participants performed foot care on an average of 4 to 5 days a week.^{10,19} Most individuals also did not fully understand the meaning of their blood glucose or lab results. Additionally, participants cited that their financial burden limited their ability to utilize healthcare services and engage in certain costly self-care activities such

as obtaining glucose-monitoring equipment.^{10,15,18} Many participants also reported feeling socially isolated due to their diet restrictions from the diabetes. Psychologically, participants felt uncertain about the future and expressed feelings of fear, anxiety, stress, and depression affecting their blood glucose levels.^{10,12,15,18,19} Additionally, many lacked a support system to help cope with and overcome the challenges faced due to this chronic disorder.^{15,17,19} Thus, healthcare provider feedback and support were crucial to these patients especially during difficult times.^{8,18}

■ Medication management

Out of the self-management methods examined, taking medications as prescribed seemed to have the highest overall adherence. However, three studies shared that some individuals modified their medications based on their own health beliefs or withheld medications due to concern about negative medication adverse reactions.^{13,15,18} In another study, one patient did not understand why her blood glucose fluctuated despite taking her medication.¹⁶ Similarly, another participant shared that he did not observe any therapeutic effects of the medication.¹³ These experiences led the participants to incorrectly assume that the medications were not working or were not necessary.^{13,16} According to one of the studies, medication adherence may be the most important self-care behavior for achieving glycemic control in LSES populations.¹¹ However, some individuals had trouble accessing medications due to ongoing difficulties, including high cost, lack of insurance, and problems navigating the healthcare system.^{13,15,18} Another participant used occasional free medication samples and reused her syringes multiple times to manage the condition.⁸ Although there were some misunderstandings and adherence concerns regarding medications, researchers noted that most of the participants felt medications were an essential part of their diabetes management and followed medication recommendations 6 out of 7 days.^{13,19} High cost, lack of insurance, difficulty accessing healthcare, medication adverse reactions, and simply forgetting were the main barriers reported on medication adherence.^{13,15,18}

■ Self-monitoring of blood glucose

Self-monitoring of blood glucose (SMBG) was another challenge for the LSES population as most of the participants were unaware of a recommended blood glucose goal, and some described their management regimens as “unguided trial and error” when they followed advice from others in their social networks.^{8,16} The frequency of blood glucose monitoring also varied widely; one study reported that some patients checked their levels about 4 days of a week while another article noted some only monitored their blood glucose levels when they did not feel well.^{8,19} Additionally, some patients faced challenges with SMBG due to the cost of test equipment and supplies.^{10,11,19} In another study, researchers reported that SMBG rates remained low despite access to free glucometers and test strips possibly due to unexpected environmental challenges related to severe flood events.¹⁴ Although participants knew how to monitor glucose levels, the ability to interpret their blood glucose patterns varied.¹⁶ Thus, structured testing and interpretation instructions from providers may be necessary.¹⁴ While patients understood SMBG was an important tool in diabetes management, many did not actively monitor their blood glucose levels due to stress, fatigue, or high cost.^{10,14,19}

■ Dietary aspects

Dietary aspects of diabetes self-management proved to be the most difficult for participant adherence. Some individuals could not verbalize specific dietary modifications while others could not afford or adhere

Medication adherence may be the most important self-care behavior for achieving glycemic control in low-socioeconomic status populations.



to a strict diet to control their glucose levels.^{15,17-19} Other participants struggled to cook healthy meals due to time constraints and only managed their condition through medications.⁸ Participants tried to adjust their diets, but many faced difficulties understanding dietary recommendations such as comprehending information on food labels, trouble counting calories, and confusion about portion sizes.¹⁶ In a recent study, a patient mistakenly tried an all-liquid

fruit juice diet before becoming ill and realizing its negative effect on her blood glucose levels.⁸ Additionally, family and cultural preferences for a high-carbohydrate diet sometimes negatively influenced food choices and dietary habits, which made it more difficult to make changes.¹⁷ Barriers to dietary modifications included stress, fear of social isolation, limited time and accessibility, and increased cost to obtain the necessary foods to maintain a diabetes-



Many participants expressed a desire to increase their physical activity levels but faced deterrents such as arthritis, injuries, climate extremes, and high-crime neighborhoods.

friendly diet.^{8,11,17-19} In some cases, comorbidities such as advanced kidney disease (necessitating limiting the amount of protein and potassium consumed) and cardiac conditions (requiring salt restrictions) further narrowed their dietary options.¹⁸

■ Exercise

Participants varied widely in their levels and frequency of exercise. Some reported exercising infrequently—2 to 3 days out of 7.^{10,19} In another study, many participants held different ideas of what constituted exercise.¹⁵ Most reported mild daily activity such as walking or cleaning around the house, but some did engage in more rigorous exercise through labor-intensive jobs.^{15,17,19} While patients understood the importance of exercise, some did not understand the level or type of physical activity that would help manage their diabetes.¹⁵ Providers may need to offer tailored instructions on type, intensity, and duration of physical activity to bridge these knowledge gaps.^{10,15} Many participants expressed a desire to increase their physical activity level; however, deterrents such as arthritis, injuries, climate extremes, high-crime neighborhoods, lack of motivation, disability, and limited access to exercise facilities impeded their ability to exercise.^{8,11,16,19} According to another study, lower engagement in physical activity was seen with increasing participant age, higher body mass index scores, and less favorable psychosocial well-being.¹⁰ Additionally, depressive symptoms were associated with less exercise.¹² Participants also noted that changing established habits to begin exercising was difficult.^{8,19}

■ Strengths and limitations of the research

Some limitations should be considered in this review due to the nature of qualitative studies. A few studies were only able to focus on the participants that were more willing to disclose their attitudes and behaviors toward diabetes self-management.^{8,16} Their views may not necessarily truly represent an entire LSES population. Also, only English-language articles published in the US were included. Despite the limitations, this review presented evidence that patients of LSES face unique barriers when managing their diabetes, particularly with adherence to dietary and exercise recommendations. NPs and other healthcare professionals would

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■ Technologic advances

One of the main innovations in nursing and the healthcare system is the implementation of technological advances. This encompasses the growing use of electronic health records in clinics and hospitals, the spread of health information through the internet, social media, mobile applications, and the ability to connect to various areas using telehealth systems. The convenience of mobile applications and the internet allows patients to search for information concerning their conditions, medications, and treatments. Advanced technology has made significant impact on the delivery of healthcare and will continue to expand as telehealth services offer the opportunity to improve patient outcomes and access to care.²⁰

■ Access to technology

According to a Pew Research Center report from June 2019, smartphone ownership in America increased from 35% in 2011 to 81% in 2019.²¹ Overall, it is estimated that 84% of US households own desktop or laptop computers.²² Although mobile technology use increased widely, 75% of patients living in urban areas have a broadband internet connection at home compared with 63% in rural areas.²³ A small study in an urban clinic for a medically underserved population found that 72% of participants had access to the internet through either computers or cell

phones.²⁴ In contrast, a large study in an urban ED for an underserved population indicated that 96% of the study participants had access to the internet via mobile phone use with internet capability and many utilized the internet for health information.²⁵ The innovation in technology such as telehealth services could potentially mitigate geographic disparities and increase access to care in underserved areas.²⁶ With the growth of technology usage, NPs are using a wide variety of telehealth tools, such as real-time video and audio with patients through smartphones and computers.²⁷ Telehealth calls usually consist of both standardized and personal care.²⁷ Standardized care checks on the patient's condition, current status, and treatment adherence such as SMBG. Personalized care includes discussing a patient's psychosocial well-being and individual concerns. To help deliver successful telehealth services, NPs need to be familiar with the many telehealth devices such as computers, handheld devices, smartphones, and any preconceived attitudes about using technology in patient care.²⁷ By incorporating technology into patient care, NPs have the opportunity to provide personalized, meaningful, and high-quality healthcare. Ultimately, patients are the center of healthcare and influence the way healthcare services will be delivered. The indispensable role of the internet, computers, and personal portable technological devices will support a wide range of technology tools. As a result of the advancing technology, telehealth services will also continue to evolve based on patient needs, user preferences, and overall healthcare experiences.

■ Recommendations

Diabetes self-management is central to the health and well-being of patients. Telehealth interventions could offer synchronous videoconferencing to provide diabetes education to LSES populations. An online video conferencing option would allow these patients and families more access and flexibility. According to the CDC, a telehealth program that offered diabetes care in rural communities in Montana demonstrated positive patient outcomes in terms of self-reported blood glucose monitoring and dietary adherence.²⁸ Additionally, several studies have already shown a positive correlation between the use of mobile technology and

effective weight management, so telehealth videoconferencing that helps increase access to healthcare services may be a viable strategy for improving health outcomes for patients in LSES populations.²⁹

In addition, advancements in smartphone technology have allowed users to couple fitness trackers with applications on their phones to devise self-monitoring fitness programs. The use of fitness trackers has gradually gained acceptance among both the younger and older generations.³⁰ With the ownership and usage of smartphones exponentially rising across all age groups, the ability to videoconference is quickly becoming available to a wider population.²¹ Telehealth technology could offer supervised and personalized home exercise programs. Healthcare

By incorporating technology into patient care, NPs can provide personalized, meaningful, high-quality healthcare.



providers must be cognizant that many patients of low-income populations are aware of the importance of diabetes management but are hampered by various challenges. Thus, healthcare providers should consider the unique individual and community barriers and embrace new technologies such as videoconferencing and smartphone applications to help patients with LSES manage diabetes to reach optimal health outcomes.

In response to the public health emergency of coronavirus disease 2019 (COVID-19), the Centers for Medicare and Medicaid Services temporarily expanded telehealth services to allow broader use of technology.³¹ NPs are approved Medicare providers for providing telehealth services for rural or underserved areas.³¹ Interactive audio and video telecommunications technology must be used that allows for real-time communication between the Medicare beneficiary at the originating site and provider at the distant site.³¹ As a result of the temporary expansion, patients can access healthcare professionals using smartphones and other devices with audio and visual capabilities; otherwise, patients must go to authorized originating sites.³¹ Medicare offers telehealth reimbursement opportunities for office or other outpatient visits, diabetes self-management training services, pharmacologic management, nutrition

therapy, and other preventive services through professional service Current Procedural Terminology (CPT) or Healthcare Common Procedure Coding System (HCPCS) codes.³¹

■ Conclusions

In conclusion, this review revealed that low-income and underserved populations face many barriers to diabetes self-management practices. Participants reported limited access to healthcare services as well as difficulty obtaining the means to healthy nutrition due to social and psychological constraints. Strong self-discipline is often required to maintain appropriate self-care behaviors, and many of the participants felt overwhelmed and stressed. With limited resources and financial hardship, patients of LSES with diabetes may prioritize basic life necessities rather than monitoring blood glucose levels. Issues such as housing instability and living in medically underserved areas also exacerbate stress levels making it more difficult to receive adequate care and implement healthy lifestyle changes.

The prevalence of diabetes is increasing in low-socioeconomic groups, and it is a chronic condition that has many serious complications.⁵ In order to improve diabetes outcomes among patients of LSES, telehealth interventions and innovative technologies can be adapted to the needs of these individuals and their local communities. With increased access to care and education using advanced technologies, patients may better understand their health conditions and utilize their healthcare resources to develop optimal diabetes self-management behaviors to manage this lifelong condition. More research is needed to introduce innovative telehealth interventions that provide patient-centered and individualized programs unique to the needs of those in LSES to reduce the socioeconomic disparities in diabetes management. NPs and other healthcare professionals can use the information to better understand the unique barriers that patients of LSES face when planning for diabetes telehealth education in order to improve health outcomes in this population.

With the growth of telehealth services, NPs play pivotal roles in the adoption and integration of technologic advances in healthcare delivery as strategies to improve care in underserved areas. Telehealth allows for health services to be more widely available and are powerful tools for health information

exchange between patients and the healthcare team. Patients are encouraged to be active participants and partners in the management of their health. Using a holistic approach, NPs can use telehealth to facilitate partnerships with patients to promote positive lifestyle changes, personalized self-care measures, and evidence-based health interventions in the management of diabetes. Telehealth is a promising approach to positively impact diabetes self-management behaviors in LSES populations. **NP**

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