

Literature Review

Introduction

Type 2 Diabetes Mellitus (T2DM) is a national epidemic with 13% of the United States adult population living with this chronic disease (Centers for Disease Control and Prevention [CDC], 2020). Of the 34.1 million adults in the United States with diabetes, 14.6% are considered uncontrolled with hemoglobin a1c (HbA1c) over 9 (CDC, 2020). According to the CDC, the rates of diagnosed adults with T2DM are higher among the Black, Asian, and Hispanic race and ethnicities compared to White populations (2020). This also leads to a higher rate of uncontrolled diabetes and disease burden across vulnerable communities. Study results show that those of Black and/or Asian races are more likely to have uncontrolled diabetes, and those with lower income had higher emergency room rates and hospitalizations associated with diabetes (Tan, Lee, Huynh, Pawaskar, & Rajpathak, 2020). Uncontrolled diabetes can lead to poor outcomes such as cardiovascular disease, end-stage kidney disease, vision disability, neuropathy, limb loss, and death. In the United States, the total estimated costs associated with diagnosed diabetes in 2017 was \$327 billion (CDC, 2020). Reducing the disease burden of diabetes and improving quality of life, which includes decreasing the proportion of uncontrolled diabetes, is a Healthy People 2030 goal (Office of Disease Prevention and Health Promotion [ODPHP], n.d.).

With 54.5% of office visits in the United States occurring in primary care, primary care practices are a common setting to manage patients with T2DM (National Center for Health Statistics [NCHS], 2016). Diabetes is ranked the second most common diagnosis and the third most common reason for primary care visits at Community Health Centers (CHC) (NCHS, 2014). Nationally, there are more than 1,400 CHCs providing quality care for largely vulnerable populations, including those underserved and minority communities that have higher rates of

uncontrolled T2DM. Several barriers have been identified that may impact the effective management of patients with T2DM including access to care, transportation, housing, insurance, cost of medications, cost of healthy foods, access to safe places to exercise, low literacy, and low health knowledge. Providers also have limitations with the time given for each visit and associated costs of frequent office visits for patients. A multi-pronged and cost-effective approach is necessary to supplement the traditional care of provider visits to better manage patients with T2DM in vulnerable populations, therefore decreasing long-term complications and improving quality of life.

At a Northeast CHC serving over 2,200 adult patients with diabetes, approximately 36% of those patients are uncontrolled with a HbA1c over 9. This is a higher proportion than prior to the COVID-19 pandemic. For 2021, the Health System has a strategic focus to reduce the percentage to 30% or lower for adult patients with diabetes with an HbA1c over 9 across all races and ethnicities. By better utilizing and developing current resources and implementing an evidence-based Community Health Worker (CHW) intervention, there will be a reduction of HbA1c in adult primary care patients with uncontrolled diabetes.

Aim

The aim of this literature review was to examine CHW led interventions for diabetes management in primary care settings and their outcomes to understand whether CHW led interventions for diabetes management are effective in reducing barriers and improving HbA1c levels in adult patients in primary care with uncontrolled diabetes. A secondary aim was to determine which CHW led interventions for diabetes management were most effective to develop a sustainable program in primary care.

Search Strategy

The literature was obtained by searching CINAHL Plus with Full Text, Cochrane Database of Systematic Reviews, and MEDLINE Complete. The inclusion criteria were resources printed in English, full text that was published in the last 10 years, and the studies having human subjects. The content focus was for ambulatory primary care settings with a population of adult T2DM patients. The key words used were T2DM or Diabetes, Diabetic Management, Barriers, Community Health Workers, and Primary Care. Relevant and applicable studies completed outside of the United States were not excluded.

Results

The overall review of the literature was divided with an initial focus on the barriers that exist for providers, healthcare practices, and patients that interfere with diabetes management. Secondly, the search focused on the role and outcomes of CHW in primary care settings. Lastly, there was a focus on CHW led interventions for diabetes management. Without purposefully including it in the search, the search led to a target of racial and ethnic minority, underserved, and vulnerable populations. A total of 23 resources were included and reviewed.

Provider and Practice Barriers to Diabetes Management

T2DM is a common and complex chronic disease that often goes unmanaged. Identifying common provider and practice barriers are key to implementing successful and effective interventions to improve glycemic control. In a systematic review, researchers found the common theme of time limitations by the provider due to provider shortages leading to a large panel size that limit the provider's attention and overall time per patient visit (Siboungheuang, Olson, & Kittiboonyakun, 2020). With less time that the provider can spend with the patient, there is potential for less attention, education, and management on chronic diseases, like T2DM.

An additional limitation identified is the lack of ability to provide telehealth or online services as an alternative to traditional face-to-face care (Siboungheuang et al., 2020). This expansion has occurred temporarily during the COVID-19 pandemic, although the future of permanent telehealth access remains unknown. Telehealth would allow more efficient long-term access to patients when managing chronic diseases as well as decrease barriers to care. Lastly, the competency and knowledge of the provider in their ability to effectively communicate with patients and stay current with the disease, medications, and evidence-based treatment guidelines are other provider-related barriers for patients to achieve glycemic control (Siboungheuang et al., 2020).

Practice-level barriers that were identified include a lack of trained clinical staff that can provide competent diabetes and medication education as well as monitor for medication adherence (Siboungheuang et al., 2020). In addition, a lack of system-level program for case management and support for team collaboration was noted as a limitation (Siboungheuang et al., 2020). Without these alternate resources to supplement the provider visit, there can be a lack of individualized education, medication plans, and visual tools to assist in effective diabetes management (Siboungheuang et al., 2020). In primary care diabetes management, there is an even bigger need to focus on chronic disease follow up and a population-based program to identify patients with diabetes needing additional attention (Elliot, Robinson, Sanford, Herrman, & Riesenberg, 2011). Primary care providers recognize the need to teach and encourage self-management, however initiating or coordinating self-management during the traditional office visit and without the right support is problematic, ineffective, and not a good use of resources (Elliot et al., 2011). These barriers create a system-level foundation that can contribute to patients having uncontrolled T2DM aside from patient driven factors.

Patient Barriers to Diabetes Management

In a systematic review, researchers found the most common reasons for poor glycemic control were difficulties adhering to lifestyle changes, followed by medication side effects, missing healthcare appointments, noncompliance with medications, poor knowledge of diabetes, refusing insulin, poor medication titration, and social issues (Sibounheuang et al., 2020). There were several themes identified that contributed to these reasons. First, the authors recognized a lack of easy-to-understand education on diabetes and medication side effects as barriers (Sibounheuang et al., 2020). Patients also noted the lack of free community-based resources, education, or support groups available to aid in their diabetes management (Sibounheuang et al., 2020). Without a unified baseline understanding of diabetes through public education and public health sectors, too much reliance is given to providers to fill this gap at the time of diagnosis and management (Elliot et al., 2011).

These themes contribute to underlying difficulties in patients achieving self-management goals. Patients often report difficulties with self-management due to family or economic barriers as well as issues with awareness or motivation (Berenguera et al., 2016). Without this patient empowerment, many rely on medication adherence as the primary way to manage T2DM instead of other lifestyle changes (Berenguera et al., 2016). Lastly, patients tend to perceive a lack of disease severity if they are not prescribed injectable medications due to lack of awareness and education, potentially delaying engagement with self-management (Berenguera et al., 2016).

Other factors create patient barriers to diabetes management. Patients reported lack of access to providers and challenges in paying for medical services, medications, and diabetic supplies due to insurance coverage (Sibounheuang et al., 2020). These factors can be felt more in lower socioeconomic populations. In general, patients with diabetes who have unmet social

needs are more likely to have uncontrolled diabetes (Chambers, McAuliff, Heller, Fiori, & Hollingsworth, 2021). The top three unmet social needs found were housing quality and insecurity, food insecurity, and healthcare transportation (Chambers et al., 2021). In fact, Chambers et al. (2021) found that lack of transportation and having three or more unmet social needs were associated with the highest risk of uncontrolled diabetes. These findings are consistent with the need of additional support and alternative services for vulnerable populations to help improve diabetes management.

Role of Community Health Workers in Primary Care

Recognizing that vulnerable populations are at risk for health disparities, alternate deliveries of care to address and support unmet needs have been well-established. The 2010 Patient Protection and Affordable Care Act encouraged CHW interventions in primary care at CHCs as a component of Patient Centered Medical Homes (Ingram et al., 2017). The Institute for Healthcare Improvement also suggested use of CHW programs to meet Triple Aim goals of improving the health of a population, improving the patient care experience, and reducing healthcare costs (Brooks et al., 2018). CHW led interventions in primary care settings includes providing health education, coaching, developing self-management goals, patient advocacy, helping connect resources, case management, and providing social services or support (Kim et al., 2016). They are the most beneficial in vulnerable populations to prevent disease, reduce risks for health disparities, and improve health outcomes (Kim et al., 2016). Within this population, a majority have Medicare or Medicaid and present with a high risk of chronic disease (Ingram et al., 2017).

CHW are often of the same race or ethnicity, can speak the same language, and are familiar with the culture of the patient population, leading to a greater understanding of the

patients' experiences and use of healthcare services (Kim et al., 2016). While there is not a national standardized training for CHW, there is a required certification to get reimbursed by certain payers (Brooks et al., 2018). CHW programs often use electronic health records (EHR) to help identify care gaps, prioritize at-risk patients, and address those with certain social determinants of health that could benefit from CHW led interventions (Ingram et al., 2017). Kim and colleagues (2016) conducted a large systematic review and found CHW led interventions to be effective including an increase in cancer screenings, a reduction in cardiovascular disease risk by looking at lipids, blood pressure, HbA1c, and physical activity, as well as improved asthma control and mental disorder management. Primary care settings can also use EHR data to track long-term outcomes from CHW led interventions and address health disparities for the health system.

CHW interventions have been shown to be cost effective, particularly when they target low-income, underserved, and minority populations (Kim et al., 2016). There was an estimated annual return of \$2.47 for every invested dollar in a CHW program for enrolled patients with Medicaid (Kangovi, Mitra, Grande, Long, & Asch, 2020). Brooks et al. (2018) reported an average savings of \$2,245 per patient enrolled in a CHW intervention. Jacob et al. (2019) reported a reduction in the median change in healthcare costs related to T2DM management by \$72 per patient per year for those in a CHW intervention. Kim et al. (2016) found an incremental cost-effectiveness ratio of \$149 for 1% reduction in HbA1c due to CHW interventions. Lastly, patients who participated in CHW interventions showed a decrease in hospitalization rates, further reducing overall healthcare costs (Kangovi et al., 2020). Evidence supports CHW led interventions as being a sustainable and cost-effective program to improve patient outcomes in primary care.

Community Health Worker-Led Interventions in Diabetes Management

The Community Preventative Services Task Force recommends (2020) CHW led interventions to improve glycemic control, reduce healthcare costs, and decrease health disparities for underserved patients with T2DM. In a rural and resource-poor area with high proportion of patients with a low level of education and health literacy, culturally competent CHW successfully increased patient self-management goals and reduced HbA1c levels (Feltner, Thompson, Baker, & Slone, 2017). Collinsworth and colleagues (2014) developed a model that shifted roles like diabetes education, diet counseling, follow up, identifying barriers, and encouraging self-management away from primary care providers and gave them to a CHW partner of the care team. This model works well as an efficient use of resources for the health system and also connects the patients to a CHW that can help with social support, community resources, and care coordination (Collinsworth et al., 2014).

A 2015 systematic review by Palmas et al., reviewed 13 randomized controlled trials and found that CHW interventions had a reduction in HbA1c with more significant results occurring in higher HbA1c levels. A randomized controlled trial by Nelson et al. (2017) showed no significant HbA1c reduction in the CHW intervention group of low-income adults if the HbA1c was under 10%, however for those patients with HbA1c over 10% there was a significant reduction of 1.23 points in the intervention group. In a systematic review of 17 randomized controlled trials, the authors found that CHW interventions led to a significant reduction in HbA1c levels and an improvement in diabetes knowledge including healthy eating and medication adherence (Trump & Mendenhall, 2017). Aponte and colleagues (2017) saw that 12 months after a CHW led intervention in a randomized controlled trial, 56.6% of the participants had a HbA1c reduction of 1% or more. In a study of Black patients with T2DM using insulin, a

CHW led intervention showed greater glycemic control than the control with a HbA1c reduction by at least 1% and HbA1c less than 8% after nine months (Coleman et al., 2021).

Comparing different types of CHW led interventions in primary care with uncontrolled T2DM patients, Turner, Liaung, Ramachandran, & Poursani (2020) examined results over six months with telephone only, clinic visits without calls, and clinic visits with calls. Researchers found glycemic control was more likely when the CHW intervention included clinic visits and not just telephone only (Turner et al., 2020). In a randomized controlled trial with a population of low-income Hispanic patients with T2DM, the authors compared CHW interventions that were by phone and in person to standard care (Vaughan, Johnston, Cardenas, Moreno, & Foreyt, 2017). At six months, 57.1% of the intervention group compared to 25% of the control group met their target HbA1c goal and a significant number in the intervention group also lost weight and obtained recommended screenings (Vaughan et al., 2017). Another study compared a CHW intervention using printed material versus a digital platform on a tablet with interactive features with both groups showing improvement with HbA1c: although, patient satisfaction was slightly higher for those that used the digital platform (Heisler et al., 2014).

Aside from the differences in delivery of diabetes management interventions, there is evidence that supports who should provide the training to be the most effective. Rodriguez et al. (2018) found that CHW led interventions are more effective in T2DM management than Medical Assistant led interventions as patient care responsibilities and differences in training place focus outside of the scope of the CHW. A review of 54 articles found the longer the training duration was for the CHW, the more of an improvement there was in the patient's HbA1c (Egbujie et al., 2018). Education was the most frequently used CHW intervention for T2DM self-management, and the most used curriculum was based off The American Diabetes Association guidelines and

American National Diabetes Education Program (Egbujie et al., 2018). HbA1c is also found to be the most common and most appropriate test to measure glycemic control in intervention studies (Egbujie et al., 2018).

In an observational study looking at providers' perceptions of a CHW led T2DM program implemented in community clinics, providers state the value of CHW led education as they did not have the time or resources to effectively educate patients during visits (Collinsworth, Vulimiri, Schmidt, & Snead, 2013). Another benefit identified by the provider is that providers or nurses could educate CHW on diabetic medications and insulin so they could in turn help answer patient questions during interventions, taking pressure off the clinical teams (Collinsworth et al., 2013). Providers reported that not only did patient outcomes improve, but patients felt an empowerment as they had the tools to implement the provider recommendations and treatment plan (Collinsworth et al., 2013). Because of trust built between the patient and CHW, the CHW can often identify barriers that were not shared with the provider and allow for opportunities to connect resources or make adjustments as needed (Collinsworth et al., 2013). CHWs are part of a team-based approach to care delivery where providers and CHW can work collaboratively to improve T2DM outcomes.

Discussion

T2DM affects vulnerable populations disproportionately in the United States, creating a high disease burden and healthcare costs in already underserved communities. CHCs are a natural primary care setting that can account for various social determinants of health in the community and provide high quality care for T2DM patients. There are several common barriers that inhibit diabetes management. Providers' lack of time and the health centers' lack of case management program or dedicated staff for diabetes education are systematic faults; while the

patient often presents without baseline education, awareness, or motivation to manage their diabetes. Patients may have transportation problems or economic reasons that limit their access to care, supplies, and medications. These barriers set the foundation for poor glycemic control, particularly in vulnerable populations with greater unmet social needs.

CHWs successfully bridge the gap between the provider and patient, serving as the extra layer often needed to manage T2DM in low resource communities. They are culturally competent community members who are trained to educate, advocate, coach, identify barriers, connect resources, and develop self-management goals. CHWs perform best when they are part of the collaborative primary care team and work together to fully support the patient reach their health goals. CHW programs have been well studied in vulnerable populations, often in the CHC setting.

The evidence demonstrates CHW led interventions in diabetes management significantly reduces HbA1c, particularly if the HbA1c was uncontrolled at onset. There are numerous secondary benefits including increased diabetes knowledge and a decrease in weight, blood pressure, and cholesterol levels. Despite the increased costs of implementing a CHW program, evidence shows that this is offset by the health care cost savings of more controlled glycemic control, decreased hospitalizations, and reduction of long-term complications. Because of this, CHC have been able to sustain CHW programs. The most effective CHW led interventions include in person visits, standardized education materials, well-trained staff, and an integrated team-approach to care.

Conclusion

CHCs that incorporate CHW interventions as part of their patient care for patients with uncontrolled diabetes will improve outcomes, reduce disparities, and decrease health care costs.

By providing the additional support that the provider and patient need to successfully manage T2DM, CHW programs have been shown to be effective and sustainable in the CHC setting caring for vulnerable populations. Implementing CHW interventions in a Northeast CHC will lower the proportion of T2DM patients with uncontrolled HbA1c levels.