

Evidence-Based Educational In Home Program to Improve Self-Management Adherence and  
A1C Levels for Patients with Diabetes

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### Abstract

**Background:** Diabetes diagnosis rates continue to grow, affecting many patients, communities, and health care organizations. One of the greatest challenges faced by patients with diabetes is maintaining diabetes self-management activities including self-blood glucose monitoring, physical activity, a healthy diet, and daily foot checks in order to control their diabetes and reduce their A1c. Diabetic Medical Concepts (DMC) previously provided intermittent and inconsistent in-home diabetes self-management education. An in-home diabetes self-management education program, adherence system and A1c testing component was implemented among DMC's patients as part of a quality improvement project.

**Aim:** The aim of the quality improvement project was to provide in-home diabetes self-management education and A1c testing to determine if these education sessions had an impact on patient's diabetes self-management adherence and A1c levels.

**Methods:** The education was provided in the patient's home by DMC home health care nurses once a month for 3 months. The education session included discussion of the American Association of Diabetes Educators (AADE7) handouts and following the in-home education checklist provided to each nurse. Patient adherence to the diabetes self-management education was measured by the Summary of Diabetes Self-Care Activities (SDSCA) questionnaire. A1c testing was performed in the home by point-of-care testing provided by the nurses.

**Results:** The results revealed improvement in overall adherence to SDSCA activities (SBGM, physical activity, a healthy diet, and daily foot checks). The difference between the pre- and post-compliance mean scores of 23.24 points (median 23.50) was statistically significant ( $p < 0.0001$ ), significance level of 5%. The pre-intervention SDSCA mean was 34.3 (SD = 7.74) and the post-intervention SDSCA mean was 57.54 (SD = 8.39). The mean difference between the A1c pre-

and post-implementation was 0.03 points (median 0) and this was not statistically significant ( $p = 0.11$ ), significance level of 5%. This result indicated that in-home diabetes self-management education had no significant improvement on the participant's A1c levels. The pre-intervention A1c mean was 8.14 (SD = 0.92) and the post-intervention A1c mean was 8.11 (SD = 8.11).

**Conclusion:** Incorporating in-home diabetes self-management education increases patient adherence to diabetes self-management and may potentially reduce A1c levels with further duration.

### **Background and Significance**

Diabetes Mellitus is a growing healthcare concern among various demographic groups. Since 2000, the International Diabetes Atlas (IDA) has measured the global prevalence rates of diabetes and estimated that, as of 2017, 415 million adults worldwide have diabetes, with nearly half of them going undiagnosed (2017). Guariguata et al. (2014) found that diabetes mellitus impacts an estimated 382 million adults in 219 countries across six continents. Cho et al. (2018), meanwhile, found a prevalence rate of 451 million people with diabetes, with that number estimated to grow to 693 million by the year 2045. Five million deaths across the globe were related to diabetes and \$850 million was spent on diabetes care. This number is anticipated to rise to \$5 billion by the year 2045. Cho et al. also noted that the greatest growth in type 2 diabetes was in the developing world. Urbanization and the influence of Western nations, including its food production and technology, allows for greater caloric consumption and more leisure activities, which are contributing factors to type 2 diabetes. As various sources have demonstrated, diabetes rates continue to grow across the globe, affecting many nations, and global healthcare expenditures on diabetes continue to rise.

The goals of *Healthy People 2020* include increasing the proportion of persons with diagnosed diabetes who receive diabetes education, increasing the proportion of adults with diabetes who perform self-blood glucose monitoring (SBGM) at least once daily, and increasing the proportion of the diabetic population with A1c values of less than 7% (U.S. Department of Health and Human Services: *Healthy People 2020*, 2019). To achieve these goals, additional avenues for diabetes self-management education must be opened, allowing patients more time to receive patient education about their chronic health conditions with more frequency, providing

those with chronic health conditions the knowledge, skills, confidence, and support they need to manage their disease effectively in the context of their everyday lives.

One of the largest challenges for healthcare providers is addressing the continuing needs of patients with chronic illnesses such as diabetes. Self-care in diabetes has been defined as developing the knowledge necessary to manage the complex nature of diabetes in a social context (Cooper, Booth & Gill, 2003). Diabetes self-care activities are behaviors that patients with diabetes undertake to successfully manage the disease on a daily basis (Tomky et al., 2008). Funnell (2010) defined diabetes self-care activities as SBGM, physical activity, eating a healthy diet, and regular foot exams.

With the majority of the day-to-day care of diabetes being handled by patients, there is an important need to provide these patients with consistent diabetes self-management education. The diabetes self-management education addressed in this project included SBGM, proper physical activity, eating a healthy diet, and regular foot exams. Wing et al. (2001) found that only 48% of patients surveyed stated that they followed their provider-recommended diabetes self-care activities. Hing, Cherry, and Woodwell (2006) found that 90% of patients received care for their diabetes from their primary care provider (PCP), with diabetes care and management accounting for 3% of all outpatient visits. Most patients with diabetes see their PCP only four times per year. With these constraints, all components of diabetes self-management including diabetes self-management education may not be covered during a typical PCP visit.

The cost related to diabetes self-management can be prohibitive to some individuals. Individuals diagnosed with diabetes spend roughly \$7,900 more per year on medical expenditures than individuals without diabetes (2018). Individuals diagnosed with diabetes will

spend on average 2.3 times more on medical expenditures over their lifespan than those without diabetes (2018).

One of the methods that would allow more time for diabetes self-management education is providing the education in the patient's home. Ashton and Oermann (2014) highlighted the unique benefits of providing education in the home healthcare environment. Patients are granted more autonomy and view the surroundings as comfortable, allowing for a more receptive patient. Patients feel that they are on equal footing with the healthcare provider, no longer being lectured to but, instead, being taught. Providers, in turn, feel like guests in the patient's home, removing any air of power or arrogance that may exist in a typical office setting—a setting that can often intimidate patients.

Currently, Diabetic Medical Concepts (DMC), a provider of homebased care for patients with diabetes, lacks any structured diabetes self-management education for their home healthcare patients. Their patients receive an initial education session upon enrolling with the organization; however, the education is inconsistent among different nurses and lacks any follow-up or a metric to determine its effectiveness. This quality improvement (QI) project has provided a clear and concise education model with a uniform checklist, allowing all DMC nurses to provide consistent diabetes self-management education.

### **Definition of Key Terms**

Following are definitions of key terms used for the project.

*Diabetes Mellitus:* A disease in which the body's ability to produce or respond to the hormone insulin is impaired, resulting in abnormal metabolism of carbohydrates and elevated levels of glucose in the blood and urine

*A1c:* A component of hemoglobin to which glucose is bound. A1c is also defined as estimated average glucose over a 3-month period.

*Self-management education:* Granting individuals with chronic health conditions the knowledge, skills, confidence, and support they need to manage their disease effectively in the context of their everyday lives (Fagan, Longh, Fenner, & Kidd, 2015).

*Healthcare cost:* The cost to deliver healthcare to patients; the amount payers (i.e., insurance providers) pay healthcare services or suppliers on behalf of the patient; the amount the patient must pay out of pocket for healthcare services (Arora., Moriates., & Shah, 2015).

*Perceived barriers:* A person's feelings about the obstacles to performing recommended healthcare activities, including social, personal, environmental, and financial costs (Champion et al., 2009).

*Diabetes education components:* The components include SBGM, physical activity, eating a healthy diet, and regular foot exams (Funnell, 2010).

*Perceived facilitators:* Social and/or structural elements related to internal or external feelings or support that may help patients to achieve a goal (Champion et al., 2009).

*Diabetes self-management education:* The constant development and application of skills, understanding, and abilities related to diabetes self-management. The education consists of evidence-based standards incorporated with the individual patient's needs and understanding (Funnell et al., 2010).

*Health beliefs and behaviors:* The idea that patients are more likely to engage in preventative action if they feel that a threat to their health poses a large enough risk. As demonstrated in the Health Belief Model, behavior change interventions are more likely to be effective if they

address an individual's perceptions related to susceptibility, benefits, barriers, and beliefs (Champion et al., 2009).

### **Purpose Statement**

The purpose of this quality improvement (QI) project was to understand diabetes self-management education in the patient's home and to determine if this education had an impact on self-management adherence and the patient's A1c levels. In this quality improvement project, patient diabetes self-management education (including SBGM, physical activity, a healthy diet, and daily foot checks) was provided in the home and diabetes self-management adherence was examined. In addition, patients' A1c levels were reviewed pre- and post-program education.

### **Problem Statement**

Only 57.4% of adults, 18 years of age or older, who have been diagnosed with diabetes mellitus, report receiving diabetes self-management education in the past. This fails to meet the Healthy People 2020 objective of having 62.5% of patients diagnosed with diabetes receiving self-management education (CDC, 2014). The number of patients with type 2 diabetes mellitus who receive diabetes self-management education including SBGM, physical activity, diet, and foot care is low. Li et al. (2014) found that only 6.8% of patients who were diagnosed with new-onset type 2 diabetes, and who had private health insurance coverage, received diabetes self-management education within the first 12 months of diagnosis. Patients with Medicare received diabetes self-management education 4% of the time within the first 12 months of being diagnosed with type 2 diabetes (Duncan et al., 2009).

One of the education points addressed by this project was increasing patient adherence to SBGM, which is recommended for the proper management of diabetes and plays a critical role in overall blood glucose control (Manaro & Doshi, 2016). However, many patients do not perform

SBGM as often as their providers instruct. Hu, Zhang, Huang, and Zhu (2017) found that patient adherence rates varied wildly, with only 57.6% of patients self-monitoring blood glucose at a frequency directed by their providers.

Physical activity was also addressed at the in-home education program. Education on physical activity or exercise is currently lacking for patients diagnosed with type 2 diabetes. The World Health Organization (2015) recommends that adults, 18 years of age or older, perform 150 minutes of moderate-intensity aerobic physical activity throughout the week. The American Diabetes Association states that 150 minutes per week of aerobic exercise improves glycemic control in patients with diabetes. An alternative would be at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week or a combination of moderate and vigorous-intensity activity. Physical activity can improve glycemic control in patients with type 2 diabetes (Colberg et al., 2016). García-Pérez et al. (2013) found that adherence rates to physical activity recommendations from healthcare professionals are low among patients with diabetes, with an average adherence rate to long-term exercise programs of 40%. In one study, Avelle et al. (2018) demonstrated that only 74.3% of patients with type 2 diabetes followed the dietary guidelines recommended by their providers. Adherence to the dietary needs of patients with diabetes was also addressed in this project.

The CDC (2019) recommends that patients with diabetes check their feet daily for cuts, erythema, swelling, blisters, corns, calluses, and ulcers. The prevalence of foot ulcers among patients with diabetes is 4% to 10%, with a lifetime incidence rate as high as 25% (Sings et al., 2005). These ulcers frequently become infected, cause considerable financial costs, lead to complications, and are often the initial complication leading to lower extremity amputation. The

importance and need for consistent daily foot checks was discussed with each patient during the project.

The National Institute of Diabetes and Digestive and Kidney Disease (NIDDK) (2016) recommends patients with diabetes engage in activities such as carbohydrate counting which involves keeping track of the amount of carbohydrate in the foods patients with diabetes eat each day. The NIDDK also states patients with diabetes should measure the amount of food servings they eat, read and understand food labels, incorporate fruits and vegetables into their daily diet, and develop a practical meal plan, with the understanding they can still eat foods they enjoy.

Locally, the patients treated by Diabetic Medical Concepts had demonstrated a need for further education on diabetes self-management activities. Many patients seen by the home health care nurses of DMC lack consistent education that empowers them to make proper and healthy choices pertaining to their diabetes care. The patients often informed the DMC nurses that they had an excess of self-blood glucose monitoring supplies indicating that they were not testing their glucose as often as directed. Furthermore, many of the patients admitted they did not feel they ate healthy, exercised enough, and had not washed their feet in many months, if longer. The nurses employed by DMC had expressed a desire for a consistent education program in which they could provide to the patients.

Patients with poor adherence to provider recommendations such as self-blood glucose monitoring, physical activity, and a healthy diet, may be at greater risk from complications related to the progression of diabetes. Poor adherence to some of these recommendations (SBGM, physical activity, and diet) may lead to elevated A1c readings. The greater a patient's A1c level, the greater the risk of complications related to the progression of diabetes. Hemoglobin A1c has been shown to improve by 1% in patients with type 2 diabetes who

received diabetes self-management education (Steinsbekk, 2012; Siminerio, Ruppert, Huber, & Toledo, 2014). Therefore, the issue of poor adherence rates to diabetes self-management activities must be addressed.

## **Literature Review**

### **Search Process**

The search criteria for the literature review included the keywords *diabetes education, diabetes self-management, physical activity, diabetes facilitator, diabetes management, glucose testing, self-monitoring of blood glucose, glucose testing adherence, glucose monitoring, self-blood glucose monitoring, economic cost diabetes, self-monitoring glucose cost, patient diabetes education, diabetes physical activity, A1c diabetic diet, and diabetic foot assessment*. These keywords were used to search databases through the Jacksonville University library. The databases searched were CINAHL Complete, Ovid MEDLINE, and PubMed. The search parameters included full-text peer reviewed articles written in English between the years 2000 and 2019. Select articles, dating to 1947, 1993, 1996 and 1999, were examined if applicable to this study. The articles included in this review focused on diabetes self-management education, economics, barriers, facilitators, and health beliefs and behaviors among patients with diabetes mellitus.

### **Purpose of the Literature Review**

The purpose of this integrated literature review was to explore the use of diabetes self-management education in the home care setting, including SBGM, physical activity, healthy diet, and foot care, and the factors related to adherence to these recommendations. The objective of this review was to identify areas that affect the patients with diabetes self-management activities, including effective diabetes self-management education, costs related to diabetes management,

perceived barriers to diabetes management, perceived facilitators to diabetes management, diabetes self-management education, and health beliefs and behaviors related to diabetes management.

### **Diabetes Self-Management**

The American Diabetes Association (2015) has estimated that close to 50% of patients diagnosed with diabetes mellitus do not achieve and maintain the recommended target hemoglobin A1c of less than 7.0%. Active participation and engagement in diabetes self-management education has been shown to improve hemoglobin A1c by 0.6% (Chrvala, Sherr, & Lipman, 2016), and increased patient self-management has been associated with lower A1c levels (Hoey, Mlinac, Tran, & Schlaeger, 2012). Patients diagnosed with diabetes have a significant amount of personal responsibility in the management of their disease, including SBGM, physical activity, healthy diet, and foot care, and consistent A1c checks (Shrivastava, Shrivastava & Ramasamy, 2013). Given the array of responsibilities that these patients must address, it is the responsibility of the provider to empower them. Therefore, diabetes self-management education is a crucial component of care for all patients diagnosed with the disease.

Relevant self-management behaviors play an important role in diabetes outcomes and in reducing the risks of long-term complications. Shrivastava, Shrivastava, and Ramasamy (2013) found that patients, when discussing self-management care, often state that the complexity of the actions they are expected to understand makes self-management of their diabetes difficult or impossible. Patients often feel overwhelmed and stressed, which leads to feelings of indifference or defeatism. Indeed, healthcare clinicians do ask patients to adhere to daily behavioral actions to care for their diabetes. These actions include engaging in positive lifestyle changes such as following a strict dietary plan, engaging in recommended physical activity, taking medications

(insulin or oral hypoglycemic agents) as directed, consistently monitoring blood glucose levels, monitoring and treating diabetes-related signs and symptoms (i.e., sipping orange juice if they feel weak), following foot care guidelines, and obtaining appropriate medical care when required.

Such a routine is often complicated by the fact that patients must integrate these activities and requirements into their daily routines (Shrivastava, Shrivastava & Ramasamy, 2013). Often, patients may feel chastised by healthcare professionals if these routines are not followed perfectly. Therefore, healthcare providers must begin any patient education assessment by evaluating the patient's perceptions and knowledge level. Allowing providers to tailor the self-management program to the patient results in realistic and specific self-management recommendations and empowers patients to become active participants in their health management.

Empowerment is a cornerstone of self-management, provides patients with a sense of dignity, and contributes to their successful learning and motivation. Schoberer et al. (2016) reviewed the use of empowering education in a long-term care setting. The patient population was provided with individually tailored, interactive, continuous, and clearly structured educational strategies that placed a strong emphasis on the use of motivational and encouragement techniques. Early findings suggested that the use of empowering strategies by healthcare providers facilitated self-determination and personal responsibility. Patient empowerment is vital to patient engagement and should be a primary focus when discussing patient adherence to self-management.

### **Diabetes Self-Management Healthcare Cost**

Silverira et al. (2018) evaluated the effectiveness of a diabetes self-management education (DSME) program in West Virginia. The main components of this study included providing post-discharge DSME at monthly primary care provider (PCP) visits for 11 months. The study followed hospitalization rates for 422 patients who completed the DSME and 1,688 patients who received no intervention over 11 months. When comparing patients who completed the DSME to those who did not, the researchers found that roughly \$35,900 was saved per 100 patients who completed the DSME course. This savings was mostly due to the prevention of hospitalizations due to diabetes complications that would have otherwise likely occurred. The monetary savings, possible through proper diabetes management education is apparent. Increasing education and proper management saves lives and money.

As domestic healthcare costs continue to rise, a contributing factor to this growth is chronic health conditions. In the U.S., chronic health conditions such as cancer, cardiac disease, and diabetes mellitus cost \$1.1 trillion per year. When factoring in a reduction in economic activity from these patients, the cost becomes \$3.7 trillion (Water & Graff, 2018). The upward trend of diabetes direct care costs begins in 2007, at \$116 billion. In 2012, the cost increased to \$176 billion, and in 2017 the cost jumped to \$237 billion. The amount spent on diabetes management averages about \$16,752 per year per patient. Roughly 25% of all healthcare dollars spent in the U.S. is spent on diabetes management (Riddle & Herman, 2018).

While the complications and medication costs related to diabetes are immense, an additional factor is the high cost of the patient's SBGM. Ipp, Aquino, and Christenson (2015) stated that while patient SBGM is one of the most important diabetes management activities, this action does not come without an economic cost. SBGM testing strips are the costliest aspect of self-monitoring, ranging between 20 cents to \$2 for each strip. Insurance coverage and payments

vary from patient to patient. Extrapolating this number to patients who must test three times per day, the cost of strips over the course of a year is considerable, particularly among low-income patients or those who lack insurance coverage. The cost of strips, multiple medications, and numerous provider appointments increases the financial burden for patients with diabetes.

These costs are a contributing factor to poor adherence to SBGM among patients with diabetes (Ipp, Aquino, and Christenson, 2015). Patients must be provided with the proper tools to become engaged in their own health management. Patients who pay a lower cost for glucose strips are likely to test more often and refill their prescription for the strips as indicated more often than patients with a higher cost who test less often and may not refill their test strips at all (Ipp, Aquino, and Christenson, 2015). This is important because, as Xie, Agiro, Bowman, and DeVries (2017) found, patients who tested more frequently had a higher likelihood of glycemic control. Xie, Agiro, Bowman, and DeVries (2017) suggested that if the cost of the SBGM is lowered, adherence rates would likely increase, leading to tighter glycemic control. These findings indicate that increased glycemic control often leads to fewer diabetic complications, which may lower the total amount of healthcare dollars spent on diabetes management nationally.

A cornerstone of diabetes self-management education is a healthy diet. Currently, the Centers for Disease Control and Prevention (CDC) recommends a diet consisting of vegetables, starchy grains, and lean protein for all diabetes patients (Diabetes Meal Planning, 2019). Research has shown that a healthy diet can help control glycemic levels in patients with type 2 diabetes (Dombrowski et al., 2014). However, Rao, Asfin, Singh, and Mozaffarian (2013) found that eating healthier foods does have a direct economic cost on the consumer, amounting to about \$580 per person annually. The argument can be made that the individual patient's economic cost

of consuming a healthier diet is balanced by the economic benefit that a healthy diet would provide to overall healthcare costs nationally. Anekwe and Rahkovsky (2013) estimated that the annual economic benefit nationally of healthy eating would be \$114.5 billion due to increased management of chronic diseases such as diabetes. When diabetes self-management education programs are operating at peak service though, they often struggle to cover direct costs (Brown et al., 2012). This makes them susceptible to elimination, despite their potential to reduce healthcare costs and improve health outcomes for patients with diabetes. Brown et al. (2010) concluded that healthcare organizations need to take a more long-term view of the overall economic costs that diabetes self-management education provides to their organizations.

### **Diabetes Self-Management Barriers**

To increase the number of individuals with diabetes who receive diabetes self-management education and to increase their adherence, it is necessary to review the barriers to diabetes self-management. SBGM is one of the most crucial aspects of effective diabetes management, however, many barriers to it exist. Improved glycemic control among patients has demonstrated fewer macrovascular and microvascular complications. Effective SBGM can detect hypoglycemic and hyperglycemic events while enabling the titration of diabetic medications, including insulin. Studies have shown a direct correlation between a reduction in blood glucose and fewer diabetic complications in both type 1 (The Diabetes Control and Complications Trial, 1993) and type 2 diabetes (United Kingdom Prospective Diabetes Trial, 1993). Despite this research, many patients still do not test as often as recommended. One of the key barriers to SBGM implementation is finances, with monetary costs playing a large part in appropriate SBGM testing. With diabetic strips, meters, and lancets often costing hundreds of dollars annually, many patients only test as often as financially reasonable (Schwandt et al., 2017).

The use of SBGM is inversely related to the cost of testing strips. Patients are less likely to test as instructed if they have to pay higher out-of-pocket costs to purchase testing supplies. Other barriers include patients experiencing disappointment and aggravation related to elevated blood glucose readings. Patients will often test less or discontinue testing for a brief time if the readings are not in line with their goals or expectations. Ong, Chua, and Ng (2014) found that inconvenience, such as testing in the workplace or while on vacation, was another issue cited by patients, along with pain/fear of needles, a knowledge deficit, lack of understanding the importance of SBGM, and stigma. Some patients believed that SBGM was only appropriate when they felt sick or if they were changing medications or the dosage of a medication.

Consistent exercise also has extensive health benefits for patients diagnosed with diabetes mellitus, including improved cardiovascular health leading to a reduction in cardiovascular disease and insulin resistance. Regular physical activity has also been shown to decrease patients' weight, and weight is one of the risk factors known to increase the complications related to diabetes (Colberg, et al., 2016). Yardley et al. (2014) found that increased physical activity is associated with a lower risk of complications from diabetes, however, more than 60% of adults with diabetes do not engage in the recommended amount of exercise.

Time and motivation have also been cited as barriers to SBGM and adherence to a proper exercise regimen. Nguyen and Edwards (2014) found that patients often stated they were aware that exercise was important to health management, but they did not have the time since work or other personal responsibilities were their priorities. Thus, they did not leave enough time in the day to test their glucose or exercise as instructed. Some patients believed that they received enough exercise through work activities at their places of employment and felt that they did not need additional physical exercise. Others stated that they did not exercise more because they did

not notice any signs or symptoms related to their diabetes and, thus felt that they did not need to exercise often.

Nguyen and Edwards (2014) found that additional barriers to diabetes self-management were limited including diabetes education and patient literacy. Often, patients may have difficulty obtaining proper diabetes management information. A lack of information or a misunderstanding of information about diabetes can lead to alarming results. Nguyen and Edwards (2014), for example, asked patients to discuss their understanding of diabetes. One patient stated that when he stepped on something sharp in his home, his foot began to bleed. However, he was under the assumption that if the bleeding stops quickly, the diabetes “isn't really bad” and the foot does not need to be checked by a provider. Since the patient’s foot stopped bleeding quickly, he assumed that his diabetes was not bad and that he did not need to seek care. This kind of misunderstanding and misinformation about diabetes can lead to alarming complications and dangerous outcomes. The authors concluded that patients must be provided with proper diabetes education and that such information will empower them to overcome many of these self-management barriers (Nguyen & Edwards, 2014).

When discussing physical activity, patients may often state that they lack the financial means to join a gym or buy workout equipment. However, the use of a gym or gym equipment is not required. Aerobic exercises include a brisk walk, jogging, jumping jacks, dancing, and walking upstairs (Waehner, 2019). None of these exercises requires a gym membership, workout equipment, or financial obligations. Korkiakangas, Alahuhta, and Laitinen (2009) identified internal and external barriers to exercise in patients with diabetes. Internal barriers included lack of time, laziness, shame, and fear of exercise. External barriers included weather, lack of exercise facility, knowledge about exercise, and lack of external support to continue and

maintain physical activity. Prioritizing physical activity, explaining its benefits, providing support, making time for exercise, and lessening concerns such as shame or worry about injuries should be the focus of diabetes self-management education and follow up.

A healthy diet can be an additional financial barrier for many patients, particularly those on a fixed monthly income. Rao, Asfin, Singh, and Mozaffarian (2013) found that healthier diet patterns were more expensive than unhealthier diet patterns based on either actual consumer intake of various food items or the standard 2,000 calorie diet. These authors calculated it costs an additional \$1.50 per person per day to eat a healthier diet consistently. This increase in cost represents the difference between eating a healthy diet consisting of vegetables, fruits, nuts, fish, and lean meats and eating an unhealthy diet consisting of processed foods, fatty meats, refined grains, and food with high sugar content. Darmon and Drewnoski (2015) found that foods of lower quality and lower nutritional value cost less per calorie. Unhealthy foods composed of refined grains, added sugars, or fats are cheaper per calorie than the recommended nutrient-dense healthy foods. Patients in a low socioeconomic category have a more difficult time affording a healthy diet.

### **Diabetes Self-Management Facilitators**

Pender (2011) suggested that high levels of social support have been linked to improved patient health and overall well-being. Social support can consist of the patient's family members, friends, coworkers, peers, healthcare professionals, neighbors, church members, and Internet forums/groups. As few as two people can provide support for one another and facilitate healthcare goals such as diabetes management (Hunt, Grant, Palmer, and Steadman, 2014). Additionally, social support and interaction are important to patients with diabetes and should be included in all diabetes education sessions. According to Pender (2011), social support and

interaction with peers allows for the assimilation of information, offers patients the chance to construct a support system, and provides them with a sense of belonging. Having fellowship with other patients who have the same disease can facilitate diabetes self-management. Patients who have diabetes reported that discussions with other patients with diabetes were a valuable source of education, information, and encouragement (Majeed-Ariss, et al., 2015). Hunt, Grant, Palmer, and Steadman (2014) found that older adults who stated that they have high levels of social interaction and a strong social network were more likely to have increased adherence rates to SBGM, healthy diets, and self-foot exams as well as increased participation in exercise activities.

Nguyen and Edwards (2014) also found that social support, particularly family support, was a key facilitator of diabetes self-management. Roughly half of the participants surveyed in their study indicated that family members' support was a crucial aspect of their self-management. Additional facilitators included the suffering of participants' peers and a sense of self-efficacy. Participants witnessing the negative experiences of others due to diabetes complications was cited as a facilitator of continued diabetes self-management care. Participants expressed a desire to avoid the complications others had experienced, stating that they would do all they could to avoid the negative effects of their diabetes. Participants who had strong personal beliefs in their self-efficacy and self-reliance were shown to have improved adherence to self-management behaviors, including blood glucose checks, consuming a healthy diet, and performing an exercise regimen (Nguyen, & Edwards, 2014).

### **Diabetes Self-Management Education**

Education is paramount to enabling patients to effectively manage their chronic diseases, including diabetes. Numerous methods exist to aid in diabetes education, including the 4 Steps approach (Devchand et al, 2017) and the BRIGHT guidelines (Basit, Khan, & Khan, 2014). The

National Diabetes Education Program created the 4 Steps to Manage Your Diabetes for Life method to assist patients with diabetes education and form a better understanding of the basics of self-management and coordination with their providers. The 4 Steps education program includes teaching patients the basics of diabetes, knowing their ABCs (A1c, blood pressure, and cholesterol), learning to live a healthy life with diabetes, and the importance of receiving routine care (National Institute of Health, 2016). Often, provider misconceptions can limit access to diabetes self-management education, including the misconception that one or a few initial education visits are adequate to provide patients with the skills necessary for the lifelong self-management of their diabetes, without any continuing or follow-up education (Fain, 2015).

Devchand et al. (2017) analyzed the effects of the 4 Steps program on 348 adults. To gauge the patients' baseline knowledge of diabetes, a pretest was conducted before providing the participants with the 4 Steps education method. The pretest ranked patients on a scale between 1 and 7 for knowledge of diabetes management, and 78% of participants scored a 6 or higher. After the pretest, each participant was provided diabetes education in the form of the 4 Step method. After the in-person education, each participant was sent home with the 4 Step booklet to review on their own. A posttest was conducted 45 days after the intervention to determine the effects of the 4 Step educational model. On the posttest, 87% of participants scored a 6 or higher. The areas of knowledge in which patients demonstrated the most improvement included A1c, the patient's role in diabetes management, and the importance of daily exercise/activity. This study demonstrated that a lack of knowledge of diabetes self-management exists among diabetes patients. Improved methods of education and proper follow-up can increase patient understanding and adherence, thus reducing diabetes complications. Improved diabetes

education should be one of the primary goals of all healthcare providers who are managing diabetes patients (Devchand et al, 2017).

Home healthcare clinicians provide a pivotal role in empowering patients to become more self-confident when managing their diabetes. Home health visits play a valuable role in diabetes education, especially for those patients in a rural environment or those that lack transportation. Home healthcare nurses are in a unique position to provide individualized diabetes education in the patient's own environment. Noris (2013) found that providing education in the patient's home allows the home healthcare nurse to assess how the patient adapts to the education over consecutive visits. For many patients, especially those who are elderly, receiving diabetes education at home has the advantage of allowing them to learn in their own environment, providing a sense of security and familiarity conducive to learning. Patients' baseline levels of knowledge need to be assessed to better determine their educational needs. Each diabetic education session should be tailored to patients and include empowering language and positive reinforcement. The authors also concluded that the emotional aspects of living with diabetes should be discussed in each educational session.

Home health clinicians should highlight the importance of SBGM, physical activity, and dietary choices that allow for tighter glycemic control. Clinicians should assess the accessibility of testing supplies/meters, healthy foods, and a safe exercise routine while working with the patient to establish an individual and management plan that is practical in light of the patient's available time and resources. It is unreasonable to expect every patient to have the same basic knowledge, resources, and capability to follow a broad education model. Improved diabetes education should be one of the primary goals of all healthcare providers who are managing diabetes patients and using persuasion and demonstration to guide patients in the proper way to

manage their diabetes may be more effective than straightforward patient education (Hunt, Grant, Palmer, & Steadman, 2014).

### **Diabetes Self-Management Health Beliefs and Behaviors**

According to Miller (2016), healthcare professionals influence the choices that patients make throughout their lifetimes. Given this influence, healthcare professionals can exert influence over patients' behaviors and beliefs, guiding them through a thought process that will, ideally, lead to healthier decisions. The primary goal of exerting such influence is to empower patients to choose to enhance their health-seeking behaviors on their own while allowing them to make their own choices about managing their health. When patients have positive beliefs about their health, they are more likely to partake in healthy behaviors like increased SBGM and physical activity adherence.

According to Cooke et al. (2013), diabetic self-management education has demonstrable positive effects on the psychosocial and health behavior of patients with diabetes. DSME has been shown to have a positive effect on patient engagement in SBGM, physical activity, diet, foot care, and on patient self-efficacy and empowerment. According to Pender (2011), patients are less likely to continue health-promoting behaviors if other activities or actions are more enticing or alluring. If a patient is short on time and has to choose between going home and spending an hour preparing and cooking a meal or driving through a fast food chain to purchase fast food, it is safe to assume that most patients will choose the latter option. With reinforcement, however, healthcare clinicians can enable patients to modify this type of behavior. If patients fully understand the impact that their behavior is having on their health, they are more likely to become active participants in the self-management of their health and diseases (Mann, De Ridder & Fujita, 2013).

While not all patients may want to play an active role in their health management, healthcare professionals and clinicians need to recognize that many patients do. Patients are co-creators and co-managers of their health and should be active participants, not just passive recipients of services or education. The inaccurate belief that patients should place all responsibility for their health management and outcomes on a clinician's shoulders can lead to poor health behaviors and outcomes. Healthcare professionals, instead, need to offer positive behavioral cues when providing patient education or speaking with patients about their health. When patients feel empowered to participate in decisions, they may see more positive experiences, further increasing positive behaviors involving their health. These findings reaffirm the importance and benefit of providing self-management education to patients with diabetes.

### **Synthesis of Findings**

During the integrated literature search on diabetes self-management conducted for this research, 70 out of 147 articles met the inclusion criteria and were selected for the review. The review indicated that a lack of consistent and poor overall diabetes management may be attributed, in part, to economic factors, perceived or actual barriers to diabetes self-management activities, inadequate educational program methods, and patients' beliefs and behaviors (Shrivastava, Shrivastava & Ramasamy, 2013; Schoberer et al., 2016; Ipp, Aquino, and Christenson, 2015; Rao, Asfin, Singh and Mozaffarian, 2013; Schwandt et al. 2017; Yardley, Hay, Abou-Setta, Marks and McGavock, 2014; Nguyen & Edwards, 2014; Korhonen, Alahuhta & Laitinen, 2009; Pender, Murdaugh, & Parsons, 2011; Hunt, Grant, Palmer, & Steadman, 2014; Majeed-Ariss, et al., 2015, Devchand et al, 2017; Mann, De Ridder & Fujita, 2013). Patients lacking in appropriate follow-up education and knowledge testing are at risk of not fully understanding the effects that SBGM, physical activity, diet, foot care, A1c testing, and

their own lifestyle choices have on their diabetes (Shrivastava, Shrivastava, & Ramasamy, 2013). Brown et al. (2012) noted that once diabetes self-management education programs are instituted within organizations, they are often quickly cut because they do not provide direct revenue once profit and loss statements are reviewed at the end of the fiscal year. This leads to a lack of consistent diabetes education and proper follow up on the self-management activities taught while the self-management educational program was active.

As Ipp, Aquino, and Christenson (2015) noted, the cost of diabetic strips can range from a few hundred dollars to \$1,000. If patients must choose to spend money on food or testing supplies, it can be expected that they will choose the former. Patients with higher out-of-pocket costs tend to have a reduced glucose testing adherence rate, again highlighting the importance of cost when addressing glucose testing rates (Ipp, Aquino, & Christenson, 2015). Increased SBGM empowerment has been shown to increase glycemic control, which reduces diabetic complication rates (Xie, Agiro, Bowman & DeVries, 2017). As noted, the CDC recommends a healthy diet consisting of vegetables, starchy grains, and lean protein for all patients with diabetes (Diabetes Meal Planning, 2019), but staying consistent with a healthy diet can be difficult for patients on a fixed income, as healthy eating increases the amount of money that patients must spend on food (Rao, Asfin, Singh, & Mozaffarian, 2013).

According to Ong, Chua, and Ng (2014), in their study reviewing barriers to SBGM, patients often complained that disappointing glucose results lead them to become aggravated or disinterested in their glycemic numbers. Patient disappointment with their glycemic results pushed them to test less often to avoid the emotions associated with negative results (Ong, Chua, & Ng, 2014). This viewpoint should be adjusted by reframing negative readings so that they serve as a motivation to achieve better glucose control. Such an adjustment in viewpoint is

similar to having an obese patient view their weight as a reason to be more physically active and to discontinue unhealthy eating habits.

An additional barrier to diabetes self-management activities is the barrier to physical activity that many patients encounter. According to Korhonen, Alahuhta, and Laitinen (2009), patients often have internal and external perceptions that keep them from participating in proper physical activity plans, including feelings of laziness, lack of exercise recommendations, believing that expensive equipment or a gym membership is required, and lack of support, follow-up and accountability, which can all be addressed with diabetes self-management education. Compounding these and financial factors (Schwandt et al. 2017), some patients also fear needles, dislike the inconveniences of testing, and doubt its importance. Educating the diabetic patient to overcome these barriers requires ongoing instruction, and the 4 Steps Education Model has been shown to improve adherence and self-management among patients with diabetes (NIH, 2016).

If patients are able to understand the basic pathology behind diabetes and its effect on the body, they will be more apt to maintain stricter glycemic control. Often, when patients hear that they are being diagnosed with diabetes, they may minimize the disease, concluding that they must simply cut down on sugar and take some medication (Devchand et al., 2017). This notion needs to be corrected through proper patient education that allows patients to understand the extent of the disease and the overall lifestyle modifications (glucose testing, diet, exercise) that must occur to prevent diabetic complications.

Facilitating diabetes self-management activities includes providing patients with a strong support system. This support system, as noted, may consist of family, friends, and healthcare providers. High levels of social support have been linked to improved patient health and overall

wellbeing (Hunt, Grant, Palmer, and Steadman, 2014). Encouraging patient adherence to diabetes self-management activities while being a valuable source of information and support will provide patients with the tools necessary to improve their adherence to self-management behaviors. Home health nurses, in particular, can act as strong facilitators of proper self-care for the patients whom they educate.

Schmitt et al. (2016), in a review of glycemic control based on A1c levels associated with the Summary of Diabetes Self-Care Activities (SDSCA) questionnaire, provided participants with a questionnaire that was divided into four subscales: glucose management, dietary control, physical activity, and foot assessment. The questions ascertained the patients' interpretations of their own behaviors and how often they performed those behaviors within the last week. The researchers discovered that diabetes self-management as measured by the SDSCA questionnaire is strongly related to glycemic control based on A1c results, reinforcing the notion that diabetes self-management plays a vital role in health outcomes (Schmitt et al., 2013).

Much of the research reviewed for this project (Hunt, Grant, Palmer, and Steadman, 2014; Majeed-Ariss, et al., 2015; Nguyen, & Edwards, 2014; Pender, 1996; Pender, Murdaugh, & Parsons, 2011), meanwhile, demonstrated the importance of social support by family, friends, peers, and social groups. Social support was shown to facilitate patients continuing their diabetes management, including SBGM, physical activity, and diet (Champion et al., 2009). Patients with diabetes reported that discussions with other diabetes patients were a valuable source of education, information, and encouragement. Having social support also leads to accountability among patients and their peers, further increasing diabetes management adherence rates within the community (Hunt, Grant, Palmer, & Steadman, 2014; Majeed-Ariss. et al., 2015; Nguyen, & Edwards, 2014).

Schoberer et al. (2016) studied the use of empowerment and positive language in diabetes education. Patients in their study were provided with education that placed a strong emphasis on individual learning, motivation, and positive reinforcement. The researchers noted that these patients were more likely to feel they had a role in their healthcare and had a deeper sense of personal responsibility. Similarly, Nguyen and Edwards (2014) discovered that patients who felt empowered had a higher sense of self-reliance and self-efficacy, leading to improved adherence to their self-management diabetes activities. Through the use of empowering language during patient education and by increasing each patient's feeling of self-control over their SBGM, physical activity diet, and regular foot check, adherence rates may improve. Overall, the integrated review of the literature supports the use of in-home diabetes self-management education sessions as an evidence-based intervention likely to increase diabetes self-management adherence rates and reduce A1c levels.

## **Framework**

### **Lewin's Change Model**

Lewin's change model (Appendix A), a common model used in the healthcare sector to adjust current standards of care, and was the theoretical framework that was be utilized in this quality improvement (QI) project. Lewin's change model was selected because it aided in the smooth transition from the current diabetes education being provided by the organization, which may not be consistent, to the implementation of a new intervention that employs a set of specific diabetes self-management education tools and follow up. Lewin's model has been shown to be successful in effecting change in the healthcare arena. The model consists of three steps: unfreezing, changing, and refreezing. (Mitchell, 2013; Batras, Duff, & Smith, 2016; Wojciechowski, Murphy, Pearsall, & French, 2016).

### **Unfreezing**

During the unfreezing stage in Lewin's change model, areas where change is appropriate are identified. Factors such as lack of a current system, stagnation in the current system, or the growing needs of an organization are determined (Wojciechowski, Murphy, Pearsall, & French, 2016). The unfreezing stage in this project, revealed that a standardized tool, education model, and follow-up care for home diabetes self-management education does not currently exist at Diabetic Medical Concepts. Reviewing the results from the pre-intervention Summary of Diabetes Self-Care Activities (SDSCA) questionnaire and introducing a pre-intervention for A1c management established a baseline assessment for this project.

### **Change**

In the change stage, two factors play important roles: the stakeholder's resistance and openness to change (Mitchell, 2013). Demonstrating to all stakeholders how the change benefited them allowed for a smoother buy-in process. It is crucial, in this stage, that the key stakeholders had bought into the proposed intervention. At this stage, the intervention for the QI project had begun, consisting of implementing the education handouts and a discussion in each participant's home once per month for three months.

### **Refreezing Stage**

The refreezing stage consists of cementing and establishing a new process while promoting its sustainability (Wojciechowski, Murphy, Pearsall, & French, 2016). During this stage, the post-intervention Summary of Diabetes Self-Care Activities (SDSCA) questionnaire and post-A1c lab draw were conducted. The information obtained was analyzed and evaluated to determine if the goals were met and the effectiveness of the implemented interventions. To promote the sustainability of the intervention, all de-identified data, handouts, and the checklist

template were provided to management. With this information provided to the organization, full advantage of the change and outcome allowed for the fostering of growth further.

### **Pender's Health Promotion Model**

Nola Pender's health promotion model (Pender, 1996) was used as the framework for this quality improvement project (Appendix B). As discussed in *Health Promotion in Nursing Practice* (Pender, 1996), the middle-range theory, health promotion model (HPM) was created with the idea that it is better to prevent illness and disease by keeping patients healthy than it is to allow a patient's health to wane and then attempt to treat any subsequent diseases or complications. In the health promotion model (Pender, 1996), facilitators can include past behavior and personality traits, including a patient's perceptions, beliefs, and support systems. Since individuals are more likely to participate in behaviors that they believe will be personally beneficial to them, patients who have a greater amount of self-efficacy have a higher chance of committing themselves to self-management and following through with actions required to achieve healthcare goals. When individuals close to a patient such as family, friends, peers and healthcare professionals support the patient in becoming more health-conscious, the patient is much more likely to begin and continue with health-promoting behaviors (Pender, Murdaugh, & Parsons, 2011).

In Nola Pender's health promotion model (1996), each person has unique personal characteristics and experiences that affect subsequent actions related to their health, such as their engagement in health promotion activities. Pender's health promotion model was selected as a framework for this project because it addresses behavior-specific conditions; perceived benefits of action, perceived barriers, activity-related effects, and perceived self-efficacy and individual characteristics and experiences; personal factors, interpersonal influences, and situational

influences. Reviewing and analyzing these topics can directly assist with the implementation of a new intervention for diabetes self-management education (Khoshnood, Rayyani, & Tirgari, 2018; Kurnia, Amatayakul, & Karuncharernpanit, 2017; Pender, 1996; Pender 2011).

## **Project Description and Design**

### **Project Design**

The process objective of this project was for each participant to receive 20 minutes of in-home diabetes self-management education sessions once per month for three months. The education session included discussion of the American Association of Diabetes Educators (AADE7) handouts (Appendix C) and following the in-home education checklist (Appendix D). The sessions occurred on a rolling basis: The first 10 participants were seen on day 1, followed by the next 10 participants the following day, until all participants are seen within 5 days. The DNP student saw 10 patients per day, allowing 50 patients to be seen within 5 days. The intervention consisted of 20 minutes of education on diabetes self-management with the aid of handouts provided from the American Association of Diabetes Educators (AADE7; 2019). The handouts address SBGM, proper physical activity, eating a healthy diet, and foot care.

The design for the project included administering a pre education program and a post education program Summary of Diabetes Self-Care Activities (SDSCA) questionnaire, developed by Toobert, Hampson and Glasgow (2000, Appendix E), at the first and last in-home education session. The DNP student provided the SDSCA questionnaire to the participants. Permission to use the SDSCA was obtained from the author of the questionnaire, Dr. Deborah Toobert (Appendix F). Participants also had a pre and post education program A1c test administered at the first and last in-home session. The project design is illustrated in the project implementation diagram (Appendix G).

## **Project Outcomes**

Process objective:

- The participant would have improved knowledge related to diabetes including SBGM, physical activity, a healthy diet, and daily foot checks.

Outcome objectives:

- The participant would obtain a higher score on the SDSCA questionnaire after the 3-month education program.
- The participant would have improved A1c after the education program.

## **Setting of Project**

The project took place in the participant's home for 20 minutes once per month over a 3-month period.

## **Educational Content**

The DNP student provided the education program consisting of SBGM, instruction on physical activity, healthy dietary food choices, and diabetes foot care. The education program consisted of the DNP student discussing handouts from the American Association of Diabetes Educators (2019). The handouts were provided to participants after each formal teaching session. The American Association of Diabetes Educators had granted permission to use the educational handouts as long as the integrity of the document and the AADE logo were maintained (Appendix H). During each education session, the DNP student followed a Diabetes Self-Management Education checklist (Appendix D). The checklist covered the areas discussed on the AADE handouts and required the initials of the DNP student and participant. The checklist was created by the DNP student to provide for consistency of the in-home education program.

## **Population and Plan for Recruitment**

A sample of 50 participants, who met all of the inclusion criteria, and were currently under the care of Diabetic Medical Concepts (DMC), were invited to participate in the education program. During the routine monthly visit, the participants were asked if they would like to take part in the education program and were informed of the purpose, risk, and benefits, as stated in the handout and discussed on the consent form (Appendix I) and recruitment flyer (Appendix J).

The inclusion criteria for the project consisted of:

1. patients between the ages of 40 and 64;
2. patients required to perform SBGM at least once daily;
3. patients possess and can operate and interpret a glucometer and have the ability to follow basic instructions;
4. patients are physically able to perform 20 minutes of physical activity multiple times per week, assess their feet, and prepare or obtain healthy meals and
5. patients are able to understand and read English fluently.

The exclusion criteria for the project consisted of:

1. patients who were diagnosed with diabetes mellitus less than 6 months ago;
2. patients who required caregiver assistance for diabetes self-management activities;
3. patients who have been hospitalized in the last 6 months and
4. patients who cannot perform exercise 20 minutes per day multiple times per week.

### **Consent and Information Protection**

Each participant was provided with a consent form describing the purpose, procedure, risk, benefits, confidentiality, withdrawal, and the project coordinator's contact information. Participants were provided with the contact information of the student project leader and the contact information of the supervising faculty Chair. All information obtained during the course

of the project was secured in a password-protected file located on a password-protected computer and stored in a secured office accessible by the DNP project leader and the faculty Chair. All personal identifying information was de-identified by a coded number. The Health Insurance Portability and Accountability Act (HIPAA) was followed.

### **Project Implementation**

This project followed the Plan-Do-Study-Act (PDSA) QI model, which is an ideal model for implementing changes in healthcare organizations because it provides a clear guide for achieving high-quality patient-centered change (Leis & Shojania, 2017).

**Plan.** For this project, the DNP project leader implemented an in-home diabetes self-management education program for a minimum of 50 participants who met all of the inclusion criteria. The project took place over 3 months. Participants received 20 minutes of diabetes self-management education in the home over the course of three in-home education sessions, 30 days apart. The education session discussed the AADE7 handouts and reviewed the in-home education checklist. The pre-intervention SDSCA questionnaire and A1c occurred at the first in-home session. The post-intervention SDSCA questionnaire and A1c occurred 30 days after the last in-home education session.

At the conclusion of the project, the pre-intervention SDSCA questionnaire and A1c results were compared to the post-intervention SDSCA questionnaire and A1c results. The steps to execute this project included discussing the project with stakeholders—the owners, the financial manager, and nurses—to explain its purpose, plan, and goals. The diabetes self-management education documents, the SDSCA questionnaire, the in-home education checklist, and the A1c testing kits were printed and purchased, respectively.

**Do.** The DNP project leader met with key stakeholders. Once stakeholder approval was obtained, the project began. During the first in-home session, the DNP project leader performed diabetes self-management education and administered the pre-intervention SDSCA questionnaire and A1c testing. The second in-home session consisted of only diabetes self-management education. The third in-home session consisted of the last diabetes self-management education and post-intervention SDSCA questionnaire. The final in-home session, which occurred 30 days after the previous education session consisted of a post-intervention A1c. All in-home education and A1c testing were performed by the DNP student.

**Study.** The findings from the pre- and post-intervention SDSCA questionnaires and A1c readings were evaluated. Pre-intervention data was compared with post-intervention data with the use of a paired samples *t*-test or Wilcoxon Sign Rank test calculated via the Statistical Package for the Social Sciences (SPSS) software. The in-home education checklist was reviewed to ensure that all patients have received instruction on all diabetes self-management topics.

**Act.** The data were analyzed to determine the project's sustainability, evaluate the need to extend or repeat the project, and decide the best way to disseminate the data throughout the organization. That knowledge was used to provide the organization with guidelines on administering diabetes self-management education in the home healthcare environment. The data also highlighted the positive outcomes that can be achieved when patients maintain high diabetes self-management adherence rates.

### **Tool Validity and Reliability**

#### **Questionnaire validity and reliability**

The Summary of Diabetes Self-Care Activities (SDSCA) questionnaire has been shown to be a concise yet valid and reliable self-report questionnaire tool for patients who are practicing

diabetes self-management activities (Toobert, Hampson, & Glasgow, 2000). Jannoo and Khan (2018) measured the SDSCA tool's validity using Confirmatory Factor Analysis (CFI). The fit indices for SDSCA were excellent, with results showing a CFI > 0.90 and GFI > 0.90. Bujang, Isamial, and Bariyyah (2016) found the Cronbach's alpha for the SDSCA questionnaire's main domains to be between 0.743 and 0.935. Further analysis showed the following results by category: diet had a Cronbach's alpha at 0.935, exercise at 0.743, blood sugar at 0.905, and foot care at 0.825. (Bujang, Isamial, & Bariyyah, 2016). At the first and last in-home sessions, the DNP project leader administered the SDSCA instrument to each participant.

### **Hemoglobin A1c validity and reliability**

Measuring hemoglobin A1c has become standard practice for diagnosing patients with diabetes mellitus. Additional methods include fasting plasma glucose (FPG) and/or oral glucose tolerance testing (OGTT). Indeed, a major biochemical marker for diabetes is consistently elevated glucose. However, FPG and OGTT only show a snapshot of the patient's glucose levels at the time the tests are performed. According to Bonora and Tuomilehto (2011), an A1c measurement is equivalent to thousands of FPG and OGTT tests, with the added benefit of including postprandial glucose levels. A1c results have been shown to be valid and reliable for tracking glucose levels over time, more so than FPG and/or 2-hour OGTT plasma glucose tests.

The brand of A1c testing kit that was used to assess the A1c levels of the project's participants was A1CNow SelfCheck, manufactured by Test Medical Symptoms at Home (n.d.). The A1CNow SelfCheck system is certified by the National Glycohemoglobin Standardization Program (NGSP), is Clinical Laboratory Improvement Amendments (CLIA) waived, and has been approved for home and professional use for the United States Food and Drug Administration (FDA). The results of clinical testing of 1,189 diabetic and non-diabetic subjects

across three U.S. sites showed that the accuracy of A1CNow SelfCheck using fingerstick samples was, on average, 99.7%. An individual result from the A1CNow SelfCheck system may differ by only -0.8 %A1c to +0.7 %A1c from the true result. Buell, Kermah, and Davidson (2007) concluded that hemoglobin A1c testing (boronate affinity high-performance liquid chromatography-HPLC) sensitivity ranged from 84% to 95% with a specificity ranging from 86% to 92% for the detection of type 2 diabetes glucose levels. Upon documenting the results in a data management file, copies of the results of the tests were destroyed via shredding.

### **August 2019 to November 2019 (Phase One: Planning)**

The project, commenced on November 1st, 2019, and was completed in late April 2020. The timeline was as follows:

- Meeting with stakeholders to discuss the QI project, including the organization's owners, the accountant/finance manager, and nurses
- Review of existing data on diabetes self-management education outcomes
- Complete literature review
- Plan for improvement of diabetes self-management education outcomes
- Contact Dr. Deborah Toobert, author of the SDSCA tool, for permission to use the tool in this project
- Contact American Association of Diabetes Educators for permission to use education handouts
- Develop intervention checklist
- Develop project proposal for monthly home diabetes education
- Develop and write the project proposal
- Consult with the statistician about the most appropriate data analysis methods

- Submit DNP proposal to DNP faculty chair for review
- Submit DNP proposal to DNP team for approval
- Submit DNP proposal to the statistician for review
- Upon approval of the DNP project, submit the proposal to the IRB

**January 2020 to April 2020 (Phase Two: Implementation)**

- Implement the AADE7 in-home diabetes self-management education for three sessions 30 days apart
- Implement a diabetes self-management education checklist for three sessions 30 days apart
- Perform the pre-intervention Summary of Diabetes Self-Care Activities Questionnaire during the first in-home education session
- Perform post-intervention Summary of Diabetes Self-Care Activities Questionnaire during the last in-home education session
- Perform the pre-intervention A1c test during the first in-home session
- Perform the post-intervention A1c test during the fourth (last) in-home session

**April 2020-June 2020 (Phase Three: Evaluation)**

- Evaluate both the pre and post Summary of Diabetes Self-Care Activities Questionnaires and A1c data.
- Consult with the statistician to write statistical analysis and interpret data
- Write the findings, recommendations, and implications of the QI project
- Present PowerPoint presentation to key stakeholders at DMC and Jacksonville University

- Disseminate findings of the project to the American Diabetes Association (ADA) and The Journal for Nurse Practitioners
- Submit the project to Virginia Henderson e-repository
- Complete the DNP portfolio

### **Stakeholder Assessment and Willingness to Change**

Stakeholders for this project, due to their various responsibilities and liabilities within the organizations, are the organization's owners, managers, and nurses of DMC. A meeting between the owners and the DNP student allowed the owners to gain an understanding of the benefits and costs of the change. As the owners are the most important stakeholders, gaining their interest and buy-in was paramount. After the owners bought into the project, meetings with the nurse managers, the finance manager, and the nurses took place for the purpose of gaining early alignment of goals and plans among all stakeholders.

The owners of the organization allowed the project to take place with their patients' participation using company resources. The finance manager provided fiduciary oversight pertaining to the cost of this project. The nurse managers ensured proper implementation of the intervention among nursing staff. Individual nurses enabled the sustainability of the interventions beyond the conclusion of the project. All stakeholders have discussed their support for this project. The organization as a whole has expressed a desire to change its current method of patient education and adopt the method from this project, including the follow-up questionnaires. The owners have expressed interest in continuing the methods used in this project for the whole organization should they prove successful.

### **Funding for Project**

Direct and indirect funding for this project was provided by the DNP project leader and the DMC. Funding for direct costs was used to purchase necessary items, including 50 A1c testing kits (2 tests per kit) at a cost of \$18.00 per unit from DMC's direct supplier. All other required materials were printed at FedEx/Kinkos, including 55 pages of AADE7 handouts at \$0.20 per page, 100 single-page SDSCA questionnaires at \$0.13 per page, 150 single-page education topic checklists at \$0.13 per page, and 100 consent forms at \$0.13 per page. The cost for permission to use the Summary of Diabetes Self-Care Activities Questionnaire was \$25. The cost for printing the required documents and the fee for the use of the SDSCA tool was paid by the DNP student. The DNP student traveled to each patient's home and provided 20 minutes of education for each patient once per month. All indirect costs, including gas and tolls required to travel to each patient's home, were paid directly by the DNP student (Appendix K).

### **Sustainability of Project**

The findings of this project were shared with the nurses and managers of DMC. Any data shared was de-identified. The owners and managers of the company have the ability to continue this project. To promote its future sustainability, the AADE7 handouts, education topic checklists, and the questionnaires were shared with DMC.

A sustainability goal is to convert the paper checklists and questionnaires to an electronic format. The company will be required to pay the nurses performing the home care visit for the additional time they spend on education sessions, administering the questionnaire, and performing the A1c test. Some of these costs may be offset if the DMC finds that in-home education and follow up results in increased self-management of diabetes adherence rates. The organization can use this information to market to patients, elevating new patient recruitment.

Furthermore, results from this project may be cited when talking to physicians who refer patients to the organization.

### **Plan for IRB approval**

All appropriate documents were completed and sent to the Jacksonville University Institutional Review Board (IRB), including the investigator assurance form, completed QI/QA form, CITI training certificates, site authorization letters, recruitment flyers, and signed mentor agreements. The DNP student used a peer review system for the project proposal and stayed in contact with the DNP chair and the IRB team throughout the approval process.

### **Evaluation Plan**

The data were collected and documented during pre and post education program home visits by the DNP student. The data were initially recorded on paper and then de-identified and recorded in an Excel worksheet in a password-protected folder on a password-protected computer located in a locked office. The data were accessible by the DNP student, the statistician and the education program Chair. All paper documents were shredded immediately after the data were transferred from the paper documents into the Excel file. The Summary of Diabetes Self-Care Activities (SDSCA) scoring system was utilized to provide data on any changes in participants' adherence to diabetes self-management activities, including SBGM, physical activity, diet, and foot care. The SDSCA scoring system, was utilized pre and post education program, and is presented in Appendix E. Pre and post education program A1c was collected. The Wilcoxon signed rank test determined if there was statistical significance within the data analysis.

## Findings

The primary goal of this Quality Improvement (QI) project was to implement diabetes self-management education in the participant's home and to determine if this education had an impact on diabetes self-management adherence activities and the participant's A1c values. In this QI project, the participant's diabetes self-management education (including SBGM, physical activity, a healthy diet, and daily foot checks) was provided in the home and diabetes self-management adherence was examined. In addition, the participant's A1c levels was reviewed pre- and post-program education. The goals of this QI project were to: 1) determine if the implementation of diabetes self-management education in the home (including SBGM, physical activity, a healthy diet, and daily foot checks) increased participants diabetes self-care adherence by reviewing SCSDA scores and; 2) evaluate whether the implementation of diabetes self-management education in the home had a positive impact on participant's A1c levels.

The relationship between diabetes self-management education and diabetes self-care adherence was assessed by comparing the pre-intervention and post-intervention SDSCA scores over three months to determine if a statistically significant change in SDSCA scores had occurred. The pre-intervention Summary of Diabetes Self-Care Activities Questionnaire was distributed and completed by participants at the beginning of the first in-home visit, prior to the first session of diabetes self-management education. The post-intervention Summary of Diabetes Self-Care Activities Questionnaire occurred after the final in-home education session.

Furthermore, the relationship between diabetes self-management education and the participant's blood glucose levels was determined by the pre- and post-intervention A1c values to evaluate if a statistically significant change in A1c had occurred. The pre-intervention A1c test

was performed during the first in-home session and the post-intervention A1c test was performed during the final in-home session.

### **Demographics**

The 50 participants that took part in this project all were between the ages of 40 and 64, with a mean age of 52.96 and a median age of 56 (SD= 8.05). Women accounted for 28 participants (mean 56%). Men accounted for the remaining 22 participants (mean 44%).

### **Goal 1: Did diabetes self-management education in the home increase diabetes self-care adherence?**

The cohort for which the SDSCA adherence testing was completed consisted of 50 participants both pre- and post-implementation. The pre- and post-adherence rates for the SDSCA are summarized in Table 1. The results revealed improvement in overall adherence to SDSCA activities (SBGM, physical activity, a healthy diet, and daily foot checks). The Wilcoxon signed-rank test was used to test the difference between the pre- and post-adherence mean scores and statistically significant rates in pre- and post SDSCA adherence scores. The difference between the pre- and post-compliance mean scores of 23.24 points (median 23.50) was statistically significant ( $p < 0.0001$ ), significance level of 5%. This indicated that in-home diabetes self-management education had a significant improvement on the participant's SDSCA levels. The pre-intervention SDSCA mean was 34.3 (SD = 7.74) and the post-intervention SDSCA mean was 57.54 (SD = 8.39). The home diabetes self-management education was shown to have a positive impact on the participant's SDSCA scores, meeting the first goal.

Table 1

<b>Variable</b>	<b>N</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Median</b>	<b>Lower Quartile</b>	<b>Upper Quartile</b>	<b>Quartile Range</b>
<b>Age</b>	50	52.96	8.05	56	46	60	14

<b>SDSCAPre</b>	50	34.3	7.74	35	27	41	14
<b>SDSCAPost</b>	50	57.54	8.39	59	52	63	11
<b>SCSCA diff</b>	50	23.24	11.65	23.5	30	15	15

**Goal 2: Did in-home diabetes self-management education have a positive impact on the participant's A1c levels?**

The cohort for which the A1c testing was completed consisted of 50 participants both pre- and post-implementation. The summary results of the A1c levels are shown in Table 2. Wilcoxon signed-rank test was used to determine the difference between the pre- and post-A1c levels and the statistical significance on the pre- and post A1c levels. The mean difference between the pre- and post-implementation was 0.03 points (median 0) and this was not statistically significant ( $p = 0.11$ ), significance level of 5%. This result indicated that in-home diabetes self-management education had no significant improvement on the participant's A1c levels. The pre-intervention A1c mean was 8.14 (SD = 0.92) and the post-intervention A1c mean was 8.11 (SD = 8.11). The home diabetes self-management education was shown to have no impact on the participant's A1c levels. Goal 2 was not met.

Table 2

<b>Variable</b>	<b>N</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Median</b>	<b>Lower Quartile</b>	<b>Upper Quartile</b>	<b>Quartile Range</b>
<b>Age</b>	50	52.96	8.05	56	46	60	14
<b>A1cPre</b>	50	8.14	0.92	8.2	7.2	8.8	1.6
<b>A1cPost</b>	50	8.11	0.91	8.2	7.2	8.8	1.6
<b>a1c_diff</b>	50	0.03	0.12	0	0	0.1	0.1

**Primary Project Aim: To determine the effectiveness of home diabetes self-management education**

The implementation of this QI project demonstrated a significant increase in diabetes self-care adherence rates post-intervention. The home diabetes self-management education increased patient participation in SBGM, physical activity, a healthy diet and daily foot checks. The SDSCA scoring demonstrated that these activities increased on average 23.24 points when comparing pre- and post-intervention scores. The results supported diabetes self-management education with a statistically significant change ( $p < 0.0001$ ) to the participant's diabetes self-care adherence. The home diabetes self-management education provided no statistically significant change to the participant's A1c levels ( $p = 0.11$ ). The mean difference between the pre- and post-intervention A1c values was 0.03 points. Although the A1c findings were not statistically significant, they were clinically significant from a quality and patient education perspective. These findings suggest that continued implementation of this home diabetes self-management education could result in increased diabetes self-care and a decrease in A1c levels in the future.

### **Limitations, Facilitators, and Recommendations**

#### **Facilitators**

Lewin's change model provided an organized approach to implement the desired changes at DMC. Allowing for smooth transition from the current diabetes education being provided by the organization, which may not be consistent, to the implementation of a new intervention that employs a set of specific diabetes self-management education tools and follow up. Nola Pender's health promotion model addresses behavior-specific conditions; perceived benefits of action, perceived barriers, activity-related effects, and perceived self-efficacy and individual characteristics and experiences; personal factors, interpersonal influences, and situational influences. This allowed the nurses to customize the diabetes self-management education to suit the needs of each individual patient, while maintain a consisted and thorough education program.

The main facilitator of this QI project was providing the diabetes self-management education in the participant's home with a conducive learning environment. As discussed previously, participants often feel more comfortable within their own home (Ashton & Oermann, 2014). Participants are granted more autonomy and view the surroundings as comfortable, allowing for a more receptive participant during the education intervention. Additionally, the home diabetes self-management education was provided over 30 minutes allowing for more in-depth information to be conveyed than what is commonly provided during routine provider office visits due to time constraints. Lastly, A1c testing was provided in the home granting patients with the ability to avoid visiting an outside laboratory and as a result, the ease of testing likely increased adherence to A1c testing.

### **Barriers**

One of the primary limitations of this project was the distribution of the SDSCA self-reporting tool as the project outcomes greatly relied on the SDSCA pre- and post-intervention scores. Self-report bias may impede on the accuracy and validity of the data obtained. To improve the quality of future QI projects and minimize bias, it is important to emphasize the need for accurate self-report data to ensure outcomes obtained generate effective therapeutic treatments for the individuals living with diabetes. Highlighting the answers are meant in no way to be punitive.

Additional limitations to this project included the small sample size of 50 participants and the short duration of the project being three months. This may have played a factor in the lack of change in the participant's A1c levels pre- and post-intervention. Increasing the duration of future projects may produce a more positive outcome on the participant's A1c levels. The last limitation of this project was the lack of comparative data when reviewing the pre- and post-

intervention scores among different demographics (i.e. gender and/or age). Recommendations for future projects would include evaluating a larger sample size of participants over a longer period and comparing SDSCA scores and A1c pre- and post-intervention scores among different genders and ages of participants.

## **Implications and Sustainability**

### **Implications for Practice**

Implications of this project for future practice include providing health care organizations with evidence-based research that demonstrates home diabetes self-management education is beneficial to the patient and the organization. With 415 million adults worldwide diagnosed with diabetes and \$850 million spent on diabetes care in 2017 (Cho et al., 2018), this is a global health issue. The onus is on health care organizations to provide tools and programs including home diabetes self-management education to help individuals manage their diabetes, thereby reducing diabetes-related complications, deaths, and costs.

### **Sustainability**

For sustainability, the DNP student provided DMC and its key stakeholders with the home diabetes self-management education program, SDSCA scoring tool, and teaching checklist. The organization is in the process of training current nursing staff to provide 30 minutes of home diabetes self-management education to their patients every three months. As the SDSCA tool is owned by a researcher other than the DNP student, the DNP student has provided the contact information to DMC so the organization may contact the owner of the SDSCA questionnaire to gain approval to use the self-reporting tool. The DNP student has played an active role in defining the duties and responsibilities of the nursing staff during the home diabetes self-management education sessions. The teaching checklist was used as an additional

tool to serve as a guide for the nurses during patient visits. Future evaluation tools will need to be implemented to conduct ongoing chart reviews of the checklist that will ensure adherence by nursing staff. Finally, training future nurses and key stakeholders on the process is important to ensure competency.

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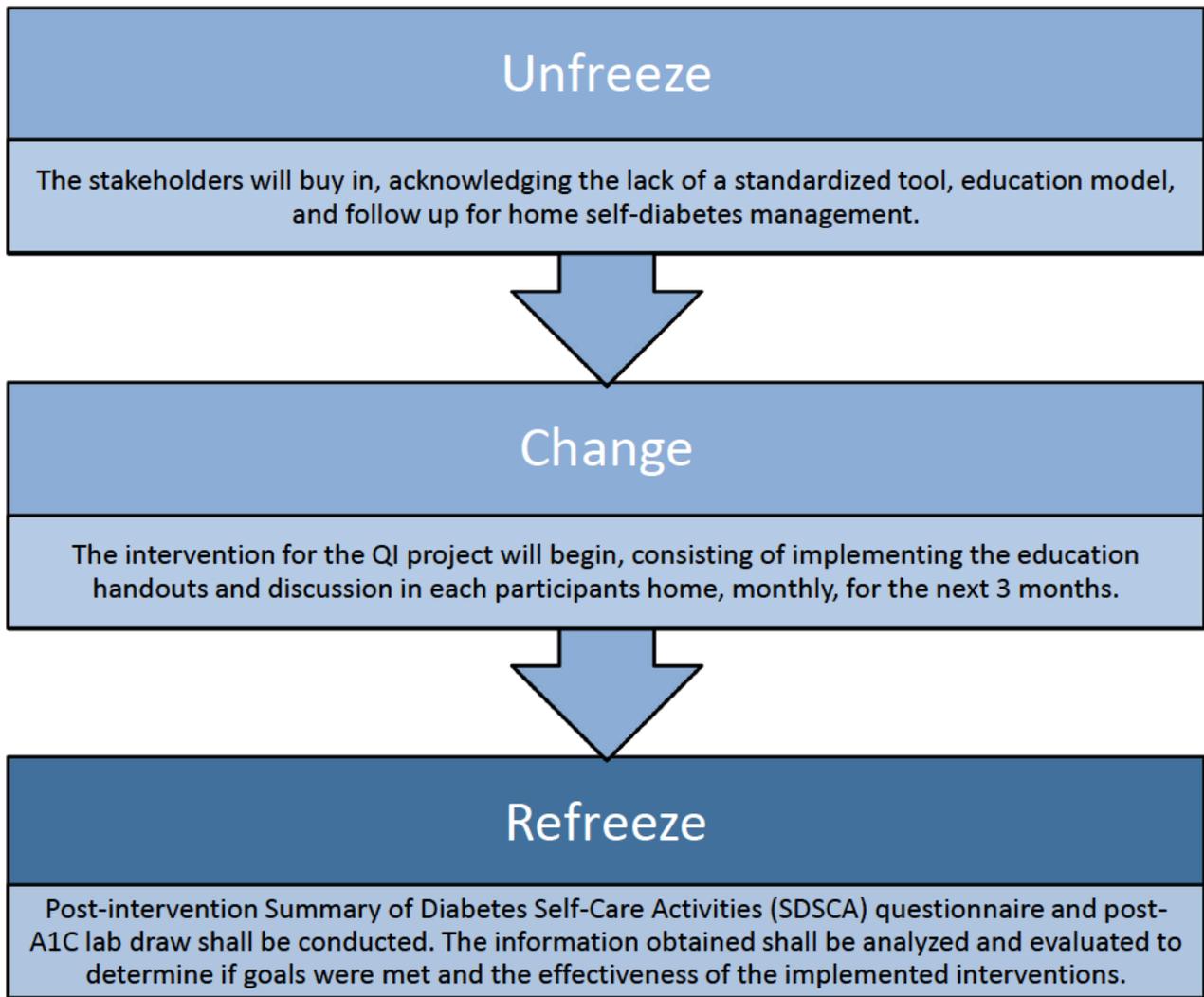
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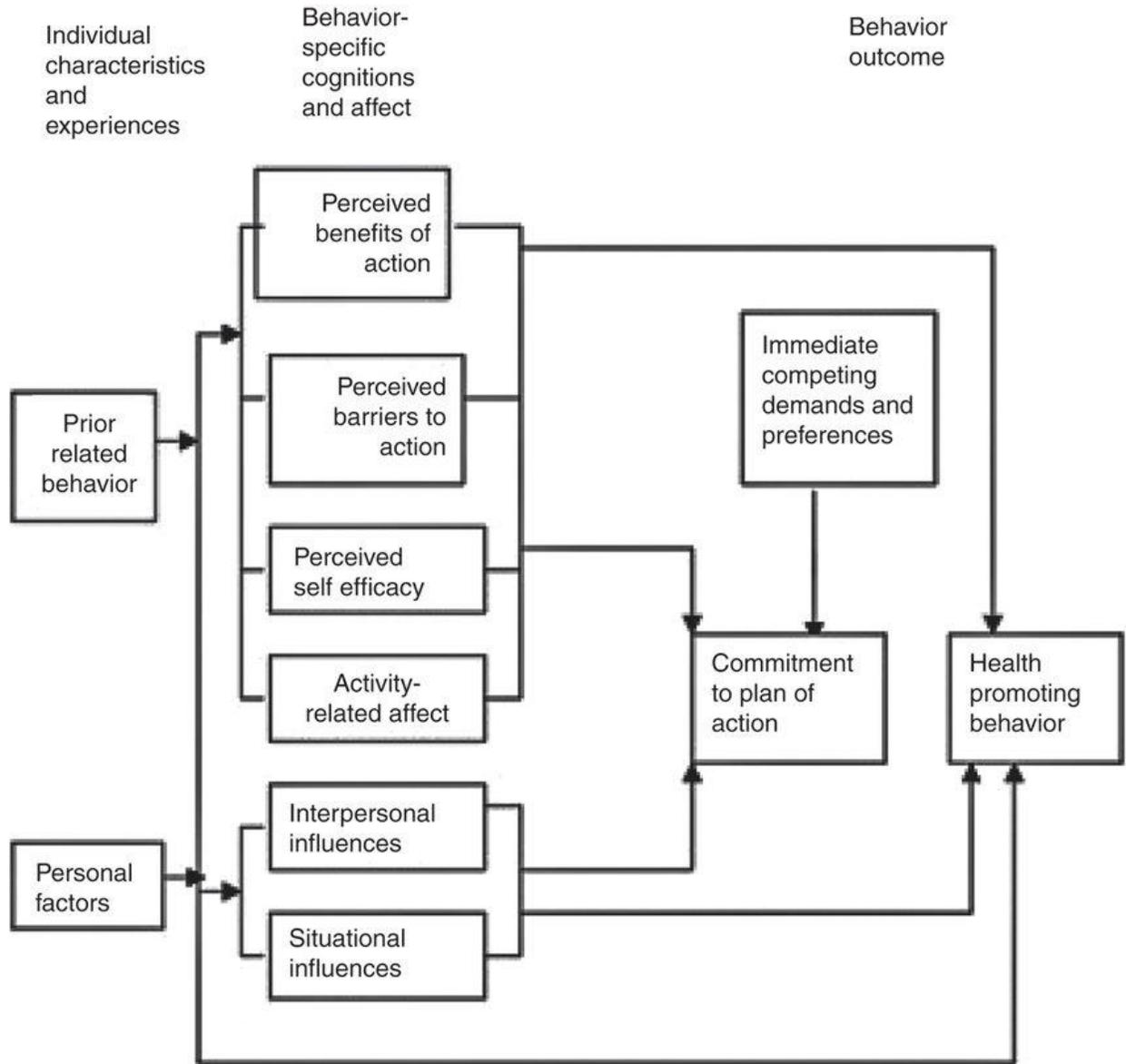
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Appendix A  
Lewin's Change Model



Appendix B  
Pender's Health Promotion Model



Appendix C  
AADE7 Education Information



AADE7™ SELF-CARE BEHAVIORS

# BEING ACTIVE

Being active is not just about losing weight. It has many health benefits like lowering cholesterol, improving blood pressure, lowering stress and anxiety, and improving your mood. If you have diabetes, physical activity can also help keep your blood sugar levels closer to normal and help you keep your diabetes in control.

It can be difficult to find the time or the motivation to start an exercise program. Everyone's physical abilities and schedules are different; choose the best ways to fit physical activity into your daily life—whether it's walking to work, doing chair exercises or working out at the gym.

The important thing to remember is to choose activities that you enjoy doing and to set goals that are realistic.

Your healthcare provider can help you design an activity plan that works for you.

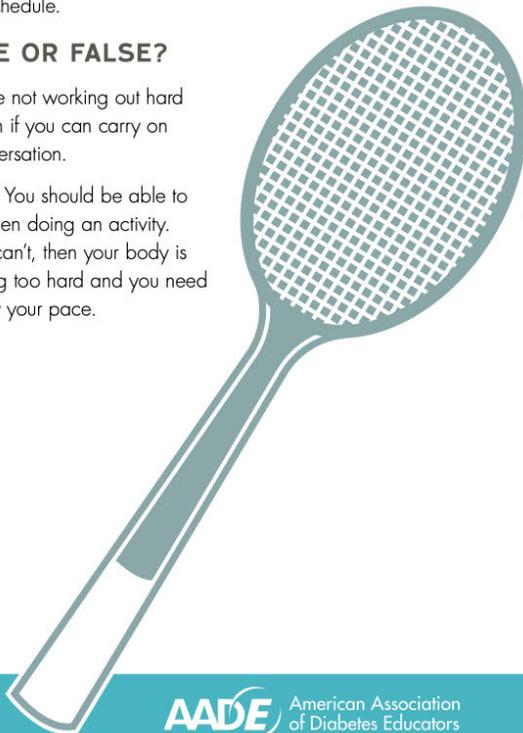
## DID YOU KNOW?

Breaking activity into three 10 minute sessions throughout the day is as good as one 30 minute session. This can help you fit exercise into your schedule.

## TRUE OR FALSE?

You are not working out hard enough if you can carry on a conversation.

**FALSE.** You should be able to talk when doing an activity. If you can't, then your body is working too hard and you need to slow your pace.



## Word Wall

### EXERCISE (OR PHYSICAL ACTIVITY):

Activities that get your body moving and help you stay healthy

### CARDIO:

Exercise that raises your heart rate

### RESISTANCE TRAINING:

Activities that help you build muscle and strength



## QUICK TIPS

*Any amount of physical activity is better than none at all. Making physical activity part of your daily lifestyle burns calories even if it's not part of a structured plan.*

*Even if you are inactive and out of shape now, you can improve your health by moving just a little more. Take small steps to add more movement into your daily lifestyle. In time, you will find that you are stronger and will be able to move even more!*

*Check your glucose before and after physical activity to learn how **your** body responds.*



AADE7 SELF-CARE BEHAVIORS®

# HEALTHY EATING

If you've just learned that you have diabetes or prediabetes, you probably have a lot of questions about what you can or can't eat. Do you wonder if you can ever have your favorite food again? What happens when you are eating at a restaurant or a friend's house? Do you have to change your whole diet just because you have diabetes?

The answer is **NO**. There is nothing that you can't eat. You don't have to give up your favorite foods or stop eating at restaurants.

But, it is important to know that everything you eat has an effect on your blood glucose (sugar). Learning to manage portion size and making healthy food choices can help you live better with diabetes and prevent other health problems.

Some skills are more complex, but your diabetes educator or dietitian can help you learn about:

- » Counting carbohydrates
- » Reading food labels
- » Measuring the amount of a serving
- » Developing a practical meal plan
- » Preventing high or low blood glucose
- » Setting goals for healthy eating

Pick one or two of these skills and discuss them with your healthcare provider.

## DID YOU KNOW?

There are only 3 main types of nutrients in food: carbohydrates, proteins, and fats. A healthy meal will include all three types.

## TRUE OR FALSE:

People with diabetes can't have sugar.

**FALSE:** Sugar is just another carbohydrate and can fit into a meal plan. Sugary foods, however, do not have the same nutrition as grains or vegetables, and can often be high in fat and calories. It's best to limit sugar-containing foods to small portions, and be sure to count the carbohydrates toward the total recommended in your meal plan.

## Word Wall

### CARBOHYDRATE (AKA "CARBS"):

One of the three main types of nutrients found in food. Bread, pasta, rice, fruits, vegetables (especially starchy vegetables such as potatoes, corn, peas, dried beans), milk, and sweets are all carbs. Don't forget that carbohydrates can be found in beverages, too.

### PORTION:

How much of a food you eat

### MEAL PLAN:

A guide for healthy eating developed with your healthcare provider

### HYPOGLYCEMIA:

Low blood glucose

### HYPERGLYCEMIA:

High blood glucose

## QUICK TIPS

*Eat breakfast every day. Breakfast helps begin the calorie-burning process that provides you with energy. Include small snacks between meals as part of your daily intake to help keep your body going.*

*Space your meals throughout the day. Going too long without eating may result in excessive hunger, which can lead to overeating later on. Try to eat every 4 to 5 hours during waking hours.*



## AADE7™ SELF-CARE BEHAVIORS MONITORING

Checking your blood sugar levels regularly gives you vital information about your diabetes control. Monitoring helps you know when your blood sugar levels are on target. It helps you make food and activity adjustments so that your body can perform at its best. It takes some time and experience to figure out how your daily activities and actions affect your blood sugar.

Your diabetes educator can help you learn:

- » How to use a blood sugar (glucose) meter.
- » When to check your blood sugar and what the numbers mean.
- » What to do when your numbers are out of your target range.
- » How to record your blood sugar results.

Checking your blood sugar is an important part of diabetes self-care, but monitoring your overall health includes a lot of other things too, especially when you have diabetes. You and your healthcare team will also need to monitor your:

- » Long-term blood sugar control—A1C, eAG
- » Cardiovascular health—blood pressure, weight, cholesterol levels
- » Kidney health—urine and blood testing
- » Eye health—dilated eye exams
- » Foot health—foot exams and sensory testing

### DID YOU KNOW?

The American Diabetes Association recommends an A1C target below 7% (an eAG of 154 mg/dl); the American Association of Clinical Endocrinologists recommends less than 6.5% (an eAG of 140 mg/dl).

### TRUE OR FALSE?

If you want to see how your body responds to your meal, wait 2 hours after eating to check your blood sugar levels.

**TRUE.** Your blood sugar rises in response to what you've eaten. It takes about 2 hours for the numbers to reflect the full rise.

## Word Wall

### METER:

A small device that is used to check blood sugar levels

### LANCET:

A small needle used to get a blood sample

### A1C:

A test that measures your average blood sugar levels during the past 2-3 months

### ESTIMATED AVERAGE GLUCOSE (eAG):

The number of the A1C test changed into mg/dl like the blood sugar levels shown on your glucose meter

### QUICK TIPS

*Wash your hands with soap and water and dry them thoroughly before checking your blood sugar. Substances on your skin (like dirt, food, or lotion) can cause inaccurate results.*

*When traveling, keep your supplies with you. Advise security personnel that you are carrying diabetes supplies.*

*If you have trouble affording the test strips, call the toll-free number on the back of your meter to see if coupons are available, or ask your diabetes educator about other resources.*



Having diabetes puts you at a higher risk for developing other health problems. However, if you understand the risks, you can take steps now to lower your chance of diabetes-related complications.

Talk to your diabetes educator and healthcare provider about potential health issues such as kidney damage, nerve damage and vision loss. They can explain why complications happen and how they can be avoided.

But don't rely on your healthcare team to identify areas of concern—you need to play an active role in reducing your risk. Make an effort to learn about complications and consistently track your overall health. You can reduce your risks for several complications by taking these precautions:

- » Don't smoke.
- » Schedule regular medical checkups and medical tests.
- » See an ophthalmologist (eye doctor) at least once a year.
- » Keep your feet dry and clean. Look out for redness or sores, and report these to your healthcare team as soon as you find them. If you have trouble seeing the bottom of your feet, ask a family member or friend to help you.
- » Be sensitive to your body—recognize when you aren't feeling well, and contact your care team if you need help identifying the problem.

#### DID YOU KNOW?

Lowering your cholesterol can decrease your risk for stroke, heart attack or other circulation problems.

#### TRUE OR FALSE?

Controlling your diabetes can help reduce your risk for heart disease.

**TRUE.** If your blood glucose (sugar) or blood pressure levels are too high for too long, your blood vessels can become sticky. This makes it easier for blood clots to form...which can lead to a heart attack or stroke.

### AADE7 SELF-CARE BEHAVIORS\*

## REDUCING RISKS

### Word Wall

#### BLOOD PRESSURE:

The amount of pressure that is applied to your arteries when blood is pumped through your body

#### CHOLESTEROL:

A waxy substance that is in your blood that exists in two types: LDL ("bad") and HDL ("good")

#### COMPLICATION:

Another health problem that can happen when you have diabetes

#### HYPERTENSION:

When your blood pressure is higher than 140/90

### QUICK TIPS

*Keep a Personal Care Record or a wallet card that lists all of the tests you should be regularly getting and the targets for each.*

*Sleep apnea affects more than half of people with diabetes and most don't know it. If you snore loudly or feel sluggish and tired during the day, ask your diabetes educator to screen you for sleep apnea.*

Appendix D  
In-Home Education Checklist

TODAYS DATE:
PATIENT NAME:
GENDER:
DOB:

**Teaching Checklist  
for Diabetes Self-  
Management Education**

Time Began/ Times Finished	RN Initials	Topic	Pt Initials
		<b>Physical Activity</b>	
		Timing, explain cardio & resistance training.	Notes:
		<b>Blood Glucose Testing</b>	
		Provide meter training, frequency/times, recording.	Notes:
		<b>HgbA1c</b>	
		Discuss last A1c, what A1c tests, A1c goal.	Notes:
		<b>Dietary Guidelines</b>	
		Discuss well-balanced meals, portion control, food labels, carb basics.	Notes:
		<b>Foot Examination</b>	
		Discuss the importance of examining feet.	Notes:
		<b>Follow up</b>	
		When is next education session, topics to discuss, DM education follow-up.	Notes:

Appendix E  
SDSCA Questionnaire

## Summary of Diabetes Self-Care Activities Questionnaire

The questions below ask you about your diabetes self-care activities during the past 7 days. If you were sick during the past 7 days, please think back to the last 7 days that you were not sick.

### Diet

Number of Days

1. How many of the last SEVEN DAYS have you followed a healthful eating plan? 0 1 2 3 4 5 6 7
2. On average, over the past month, how many DAYS PER WEEK have you followed your eating plan? 0 1 2 3 4 5 6 7
3. On how many of the last SEVEN DAYS did you eat five or more servings of fruits and vegetables? 0 1 2 3 4 5 6 7
4. On how many of the last SEVEN DAYS did you eat high-fat foods, such as red meat or full-fat dairy products? 0 1 2 3 4 5 6 7

### Physical Activity

5. On how many of the last SEVEN DAYS did you participate in at least 30 minutes of physical activity? 0 1 2 3 4 5 6 7  
*(Total minutes of continuous activity, including walking).*
6. On how many of the last SEVEN DAYS did you participate in a specific exercise session (such as swimming, walking, biking) other than what you do around the house or as part of your work? 0 1 2 3 4 5 6 7

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**Blood Sugar Testing**

7. On how many of the last SEVEN DAYS did you test your blood sugar? Number of Days
- 0 1 2 3 4 5 6 7
8. On how many of the last SEVEN DAYS did you test your blood sugar the number of times recommended by your health-care provider?
- 0 1 2 3 4 5 6 7

**Foot Care**

9. On how many of the last SEVEN DAYS did you check your feet?
- 0 1 2 3 4 5 6 7
10. On how many of the last SEVEN DAYS did you inspect the inside of your shoes?
- 0 1 2 3 4 5 6 7

**Smoking**

11. Have you smoked a cigarette, even a puff, in the past SEVEN DAYS?
- 0 No 1 Yes

### **Scoring Instructions for the Summary of Diabetes Self-Care Activities**

Scores are calculated for each of the five regimen areas assessed by the SDSCA: Diet, Exercise, Blood-Glucose Testing, Foot Care, and Smoking Status.

#### **Step 1**

For items 1–10, use the number of days per week on a scale of 0–7. Note that this response scale will not allow for direct comparison with the percentages provided in Table 1.

#### **Step 2: Scoring Scales**

General Diet = Mean number of days for items 1 and 2.

Specific Diet = Mean number of days for items 3 and 4, reversing item 4 (0=7, 1=6, 2=5, 3=4, 4=3, 5=2, 6=1, 7=0). Given the low inter-item correlations for this scale, using the individual items is recommended.

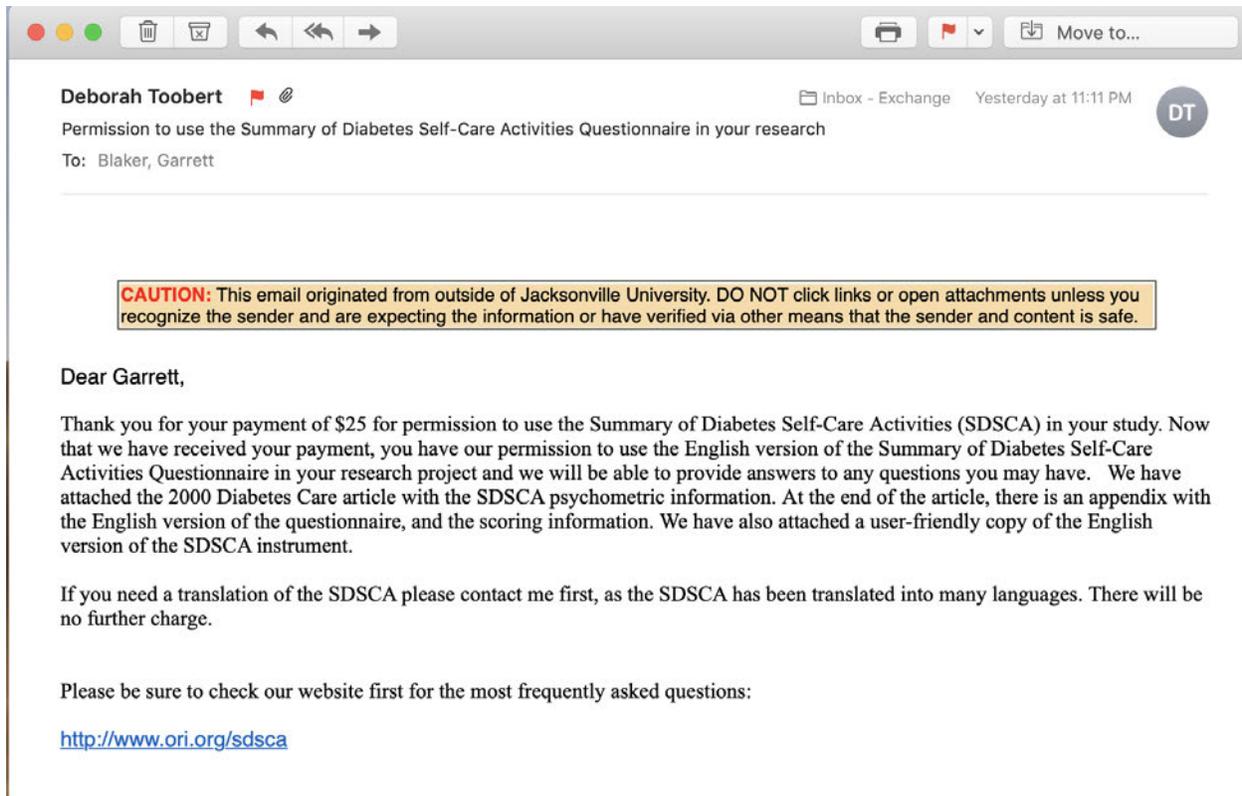
Exercise = Mean number of days for items 5 and 6.

Blood-Glucose Testing = Mean number of days for items 7 and 8.

Foot Care = Mean number of days for items 9 and 10.

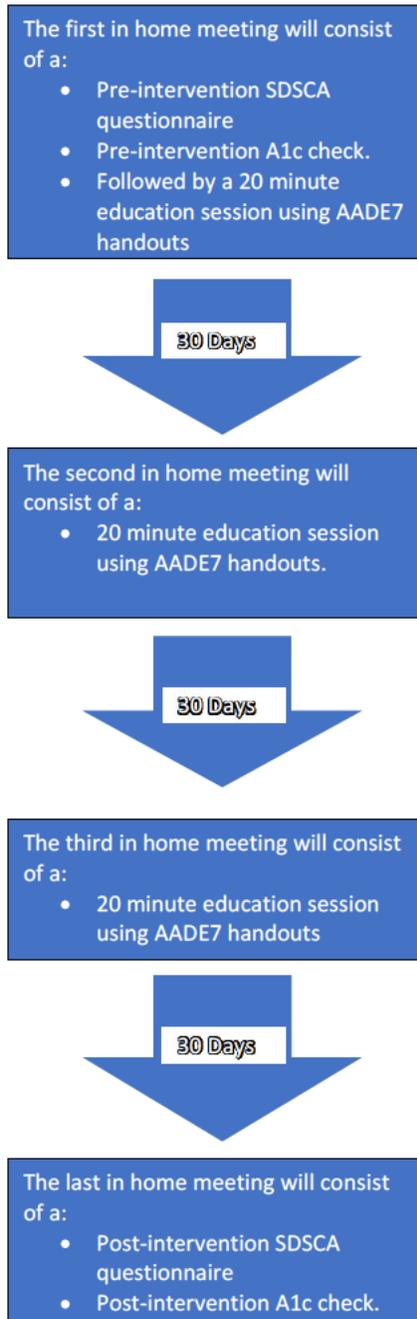
Smoking Status = Item 11 (0 = nonsmoker, 1 = smoker)

## Appendix F Permission to Use SDSCA Tool



### Appendix G Project Implementation Diagram

Project Implementation Diagram



## Appendix H Permission to use AADE7 Education Tool



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take steps now to lower your chance of diabetes-related complications.

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### Healthy Coping

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Diabetes can affect your physically and emotionally. It's natural to have mixed feelings about your diabetes management and experience highs and lows. The important thing is to recognize these emotions as normal but take steps to reduce the negative impact they can have on your self-care.

[Read More](#)

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## Appendix I Consent Form



Office of Research  
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JACKSONVILLE UNIVERSITY

### INSTITUTIONAL REVIEW BOARD (IRB): Quality Improvement Consent



#### QI PROJECT SUMMARY

**Title of the Project:** Evidence-Based Educational in-Home Program to Improve Self-Management Adherence and A1C Levels for Patients with Diabetes

**Education Program DNP Student Project Lead:** Garrett Blaker, BSN, RN, Jacksonville University

**Faculty Chair:** Kathryn Kott, Ph.D., APRN, FNP-C, Jacksonville University

**Project Statistician:** Shiva Gautam, PhD, Jacksonville University

**Study Sponsor:** Diabetic Medical Concepts

You are invited to participate in an Evidence-Based Education Program as part of a Jacksonville University, Keigwin School of Nursing, Doctor of Nursing Practice (DNP) student improvement project. The project will be supervised by the DNP Faculty Chair listed above.

To participate, you must be between 40-64 years old and English-speaking. You must have a recent diagnosis of diabetes within the last 6 months. You must be required to perform blood glucose checks at least once daily. You must own a glucose meter and be able to check your feet daily. You must be able to perform 30 minutes of exercise at least 3 times a week and prepare and/or get healthy meals. Taking part in this project is voluntary.

The purpose of the program is to determine whether your average blood glucose levels (A1c) improve with activities like healthy eating and exercise. The program will also test if diabetes education in your home helps you and possibly others manage their diabetes better.

If you agree to take part in this education program, you will be asked to let the Student Project Lead come to your home so you can listen to 20 minutes of diabetes self-management education provided by the Student Project Lead. You will be asked to fill out a questionnaire about how you take care of your diabetes, this will take 10 minutes. You will check your A1c, this will take 5 minutes. In the second and third in-home visits, you will only listen to 20 minutes of diabetes self-management education provided by the Student Project Lead. For the fourth and final visit, you fill out a questionnaire about how you take care of your diabetes, this will take 10 minutes. You will check your A1c check, this will take 5 minutes. The total time for each of the four visits will be between 30-40 minutes. We expect your involvement in this education program will take approximately 3-months with 4 separate visits. I will be collecting the following data from you. The diabetes self-management questionnaire answers and your A1c results.

There are some risks you might experience from being in this education program. These include injury during exercise. We recommend using a stationary bike if you own one or fast walking. These activities reduce the risk of injury. You may experience minor discomforts commonly associated with exercise, like muscle soreness and fatigue. Testing your A1c can cause some discomfort. The needle and amount of blood used is very small. Loss of confidentiality is possible with any study. Your data will be put in the Diabetic Medical Concepts (DMC) HIPAA compliant and password protected server. All paper forms will be shredded once they are transferred to the computer. This computer will be locked in a room at DMC. Hard copies of all consents will be stored in a locked filing cabinet, in a locked room at DMC. Only the student Project Lead, JU Faculty Chair and the JU statistician will have access to the file.

You might benefit from being in this education program because you will have diabetes self-management education given to you for free. This education may help you check your blood sugar level, increase your physical activity, eat a healthy diet and examine your feet. By doing these activities, you can have better control of your diabetes. Better control of your diabetes may mean you have fewer negative effects from your diabetes. Other people with diabetes may benefit from the information that is gained from this education program.

If you decide to take part in the education program, it should be because you really want to volunteer. You will not lose any services, benefits, or rights you would normally have if you chose not to volunteer. If you are a patient, nothing about your medical status or services will change no matter what you decide.

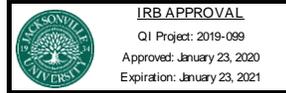
If you are interested in learning more about the education program, please continue to read below. If you are not interested, stop here.

Thank You.



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INSTITUTIONAL REVIEW BOARD (IRB):  
**Quality Improvement Consent**



**PARTICIPANT'S NAME (Print):** \_\_\_\_\_

**Title of the Project:** Evidence-Based Educational in-Home Program to Improve Self-Management Adherence and A1C Levels for Patients with Diabetes

**EDUCATION PROGRAM PROJECT LEAD NURSES:**

**Education Program DNP Student Project Lead:** Garrett Blaker, BSN, RN, Jacksonville University, Phone number, (904) 806-7885, Email: gblaker@ju.edu

**Faculty Chair:** Kathryn Kott, Ph.D., APRN, FNP-C, Jacksonville University, Phone \_\_\_\_\_, Email: kkott@ju.edu

**Project Statistician:** Shiva Gautam, Ph.D., Jacksonville University

**Study Sponsor:** Diabetic Medical Concepts

**PROJECT LEAD STATEMENT:** We are asking you to participate in an education program. The purpose of this consent letter is to give you the information you will need to help you decide whether to be in the education program or not. Please read this form carefully. You may ask questions about the purpose of the education program, the possible risks and benefits, and anything else about the education program or this form that is not clear. When we have answered all of your questions, you can decide if you want to be in the education program or not. This process is called "informed consent." We will give you a copy of this form for your records.

**THE PURPOSE OF THE EDUCATION PROGRAM:** The project aims to determine if your average blood glucose levels (A1c) improves with activities like healthy eating and exercise. The education program will also determine if diabetes education in your home helps you or others manage their diabetes better.

**PROCEDURES:** You will be asked to allow the nurse Student Project Lead to come to your home 4 times during the education program. Each of the 4 visits will take between 30 to 40 minutes. The education program will last for 3 months. Your name will be coded numerically. There will be no identifying information associated with your name. During the first visit, you will be asked to listen to 20 minutes of diabetes self-management education provided by the Student Project Lead. You will then spend 10 minutes answering an 11-question diabetes self-care questionnaire. All of the questions will ask you about the activities you did in the last week. As an example, one of the questions will ask you how many times you exercised last week. The answers from this questionnaire will be compared to the answers you give on the same questionnaire at the end of the study. You will spend 5 minutes performing an average blood glucose level check (A1c). You will use a small needle to get 0.005ml of blood for the A1c test. This test is similar to how you currently check your blood glucose. The results of this test will be compared to your coded results from the same test done at the end of the study. During the second and third in-home visits you will listen to 20 minutes of diabetes self-management education by the nurse Student Project Lead. You will not

be asked to answer any questionnaires, provide any data or do any activity. This visit will only last 30 minutes. During the fourth and final visit, you will then spend 10 minutes answering an 11-question diabetes self-care questionnaire similar to the first visit. The questions will be the same as the first questionnaire. All of the questions will ask you about the activities you did in the last week. As an example, one of the questions will ask you how many times you exercised last week. The answers from this questionnaire will be compared to the answers you provided on the same questionnaire at the beginning of the study. You will spend 5 minutes performing an average blood glucose level check (A1c) similar to the first visit.

If you decide to be in the education program, the nurse Student Project Lead will collect the following information: Number coded name, age, sex, diabetes self-care questionnaire answers, and A1c levels. This information will be collected in your home.

The nurse Student Project Lead will not be using the de-identified data in future research. Approximately, 50 participants will take part in the education program.

If you have any questions now or at any time during the education program, you may contact anyone listed under the EDUCATION PROGRAM PROJECT LEAD NURSES section.

**BENEFITS OF THE STUDY:** You may benefit from being in this education program. You will have diabetes self-management education provided to you for free. This education may help you check your blood sugar level, increase your physical activity, eat a healthy diet, and examine your feet. By doing these activities, you may have better control of your diabetes. Better control of your diabetes may mean you have fewer negative effects from your diabetes. Other people with diabetes may benefit from the information that is gained from this education program. This education program may help increase knowledge about managing diabetes in the home health care setting.

No promise or guarantee of benefits has been made to encourage your participation.

**RISKS OF THE EDUCATION PROGRAM:** The risks of taking part in this education program may include injury during exercise. You may experience minor discomforts commonly associated with exercise, like muscle soreness and fatigue. Testing your A1c can cause some discomfort, however, the needle and amount of blood used is very small. You will be shown ways to test your A1c that may cause less discomfort.

Loss of confidentiality is possible with any study. Your data will be put in the Diabetic Medical Concepts (DMC) HIPAA compliant and password protected server. All the data files will be stored as password-protected encrypted files, on a password-protected computer. This computer will be locked in a room at DMC. Only the student Project Lead, JU Faculty Chair and the JU statistician will have access to the file. All paper forms will be shredded once they are transferred to the computer. Hard copies of all consents will be stored in a locked filing cabinet, in a locked room at DMC. All data used during this education program will be de-identified and made into aggregate data. The de-identified data will be shared at the conclusion of the education program with Diabetic Medical Concepts for quality improvement purposes and to inform future education programs.

**Medical Disclaimer:** Always consult your medical provider (e.g. physician or nurse practitioner) before beginning any exercise program. To minimize the risks associated with being part of the education program, the exercises recommended will be 20 minutes of fast walking or the stationary bike riding in order to reduce the risk of injury. All suggested physical activity is based on your unique and individual health and abilities. Please consult with your healthcare professional to design an appropriate exercise prescription. If you experience any pain or difficulty with these exercises, stop and consult your healthcare provider.



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INSTITUTIONAL REVIEW BOARD (IRB):  
**Quality Improvement Consent**

**IN THE CASE OF INJURY OR ADVERSE EVENT:** Please contact the nurse Project Student Lead or Faculty Chair of this education program immediately, but also in the case of an emergency, please seek medical attention. If you experience any symptoms of weakness, unsteadiness, light-headedness or dizziness, chest pain or pressure, nausea, or shortness of breath, go to the emergency department or call 911. Mild soreness after exercise may be experienced after beginning a new exercise. Contact your healthcare professional if the soreness does not improve or worsens in any way.

Jacksonville University has not set aside funds for any medical costs, damages, or other financial losses incurred from this study. The only exception is if it is proved that your injury or illness is directly caused by the negligence of a Jacksonville University employee. "Negligence" is the failure to follow a standard duty of care.

If you become ill or injured from being in this education program, your insurer may be billed for your treatment costs. If you do not have insurance, or if your insurer does not pay, then you would have to pay these costs. If you believe you have become ill or injured from this education program, you should contact Dr. Kathryn Kott at [redacted] You should also let any healthcare provider who treats you know that you are participating in an education program.

**COSTS / COMPENSATION:** You will not have to pay for taking part in this education program. Your insurance will not be billed for the visits to your home for the purpose of this project. This project is paid for by the nurse Project Student Lead and Diabetic Medical Concepts. The in-home visits for the education program are separate from your in-home health care visits from Diabetic Medical Concepts. You will continue to have your routine in-home visits from Diabetes Medical Concepts during and after the education program.

**ALTERNATIVE TO BE IN THE STUDY:** You may choose to not participate in the education program. You may ask your health care provider to provide diabetes self-management education.

**CONFIDENTIALITY:** Records or data obtained as a result of your participation in the education program may be reviewed by the nurse Project members listed on the consents and/or the Jacksonville University's Institutional Review Board. However, they are legally obligated to protect any identifiable information from public disclosure, except where disclosure is otherwise required by law or a court of competent jurisdiction. These records will be kept private in so far as permitted by law. Also, other Jacksonville University officials have the legal right to review education program records, and they will protect the secrecy (confidentiality) of these records as much as the law allows. Otherwise, your education program records will not be released without your permission unless required by law or court order. However, if we learn that you intend to harm yourself or others, we must report that to the authorities.

The Student Project Lead, Faculty Chair, and Statistician plan to publish the results of this education program. To protect your privacy, they will not include any information that may identify you. To protect your privacy, your confidential data will be put on DMC's HIPAA compliant and password protected server, in a password-protected encrypted file, on a password-protected computer, in a locked room at Diabetic Medical Concepts. Only the student Project Lead, JU Faculty Chair and the JU statistician will have access to the file. All paper forms will be shredded once they are transferred to the computer. Hard copies of all consents will be stored in a locked filing cabinet, in a locked room at DMC All electronic data will be destroyed 3 years after the study is done. The 3 years is required by Federal law.

The project members listed above may share the education program results with other professionals and researchers without asking for your consent again, but it will not contain information that could directly identify you. The findings from this education program project will be used to write a paper. This paper will be sent to an electronic repository for other health care clinicians to read. Other investigators, professionals, or students may use the findings in this paper for future research.

**CONFLICT OF INTEREST:** The project team members listed above may benefit if the results of this education program are presented at scientific meetings or published in scientific journals.

**RIGHT TO PARTICIPATE OR WITHDRAW:** You are free to stop taking part in the education program at any time without penalty and without losing any benefits to which you are entitled. You will be provided, as applicable, with any significant new findings developed during the course of the education program that may relate or influence your willingness to continue participation.

If you decide to stop taking part in the education program for any reason, you should contact Dr. Kathryn Kott (JU DNP Project Faculty Chair) at 309-634-6121. If you choose to tell the Student Project Lead or Faculty Chair why you are leaving the education program, your reasons may be kept as part of the project record. If you decide to withdraw from the education program, it may be impossible to exclude the data that has already been collected. If you have any questions regarding your rights as a program participant, you may call the JU Office of Research & Sponsored Programs at (904) 256-7151.

You may be withdrawn from the study without your consent for the following reasons: You do not meet the eligibility criteria, you are hospitalized during the course of the study, become pregnant, are incarcerated, or you become unable to perform the task required for this study.

**CONSENT TO PARTICIPATE:** I have been informed about the education program’s purpose, procedures, possible benefits, and risks; and the alternatives to participation in the education program. I have been given the opportunity to ask questions before I sign, and I have been told that I can ask other questions at any time. I understand that my consent does not take away any of my legal rights. I also understand that nothing in this consent form is intended to replace any applicable Federal, state, or local laws.

By signing this form, I voluntarily agree to take part in the education program. I am not waiving any of my legal rights. I will receive a copy of this form.

\_\_\_\_\_  
Participant’s Name Printed

\_\_\_\_\_  
Participant’s Signature

\_\_\_\_\_  
Date

**Person Obtaining Consent and Authorization:**

\_\_\_\_\_  
Name Printed

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

## Appendix J Participant Recruitment Handout

### Participants Needed for a Quality Improvement Project

Evidence-Based Educational In Home Program to Improve Self-Management Adherence and A1C Levels for Patients with Diabetes.

**The purpose** of this evidence-based Diabetes Education Home-Based Program is to help educate and assist you with self-management of your diabetes. This educational program may help you check your blood sugar level, increase your physical activity, eat a healthy diet, and examine your feet. By doing these activities, you may have better control of your diabetes. Better control of your diabetes may mean you have fewer negative effects from your diabetes. The project will happen for three months and will include four in-home visits by Mr. Blaker.

**To participate in this project, you:**

- Must be 40-64 years old.
- Must be able to perform self-blood glucose monitoring at least once daily.
- Must have a glucose meter.
- Must be able to perform 30 minutes of exercise 5 times per week.
- Must be able to look at your feet and cook or buy healthy food.
- Must speak, read, and understand English.
- Cannot have been diagnosed with diabetes in the last 6 months.
- Cannot require caregiver (someone who takes care of you) help.
- Cannot have been in hospital in the last 6 months.
- Must agree to be visited at home four times over three months. Each visit will last between 30-45 minutes.
- Must agree to answer a form about your diabetes activities.
- Must check your A1c with a kit we give you.

**Study location:** The diabetes education, short survey, and A1c check will happen in your home. You will not be asked to pay for any part of this educational program. All cost related to the program are being by Diabetic Medical Concepts and by Mr. Garrett Blaker, BSN, including analysis of the data collected to assess your progress in the program. Your insurance will not be billed for this study.

**Benefits of participation:** You may benefit from this program by gaining a better understanding of self-blood glucose monitoring, eating a healthy diet, exercising, and checking your feet regularly. These activities may help you control your diabetes.

For more information, please contact Garrett Blaker at ( ) or Dr. Kathryn Kott at [kkott@ju.edu](mailto:kkott@ju.edu). During the project you will not be required to contact the project lead.

*This quality improvement project is being conducted under the direction of Garrett Blaker, BSN a Doctoral of Nursing Practice (DNP) student and Dr. Kathryn Kott, faculty member at Jacksonville University. The project has been approved by the Jacksonville University Institutional Review Board (JU IRB # 2019-099).*

Appendix K  
DNP Project Financial Cost

## Direct DNP Project Financial Cost

**Total**

**\$980.50**

<u>Item</u>	<u>Cost</u>
A1C Testing Kits	\$900.00
Printing AADE7 Handouts	\$10.00
Printing SDSCA questionnaires	\$13.00
Printing Education Checklist	\$19.50
Printing Consent Forms	\$13.00
Permission to use the Summary of Diabetes Self-Care Activities	\$25.00