2018

Barriers to Daiy Blood Glucose Self-monitoring in Type 2 Diabetes Mellitus

Sylvain N. Tientcheu
Walden University

Walden University

College of Health Sciences

This is to certify that the doctoral study by

Sylvain Tientcheu

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

Review Committee
Dr. Janice Long, Committee Chairperson, Nursing Faculty
Dr. Andrea Jennings, Committee Member, Nursing Faculty
Dr. Barbara Niedz, University Reviewer, Nursing Faculty

Chief Academic Officer
Eric Riedel, Ph.D.

Walden University
2018

Abstract

Barriers to Daily Blood Glucose Self-Monitoring in Type 2 Diabetes Mellitus

by

Sylvain N. Tientcheu

MS, Walden University, 2014

BS, Lamar University, 2010

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

Walden University

August 2018

Abstract

Routine blood glucose monitoring by patients with Type 2 diabetes mellitus (T2DM) is needed for effective management of T2DM; however, 75% of monitoring logs are returned incomplete during monthly provider follow-up appointments. As a result, effective management of the patient's medical condition is limited. To better understand the reasons for noncompliance, a quality improvement project (QIP) was initiated between July 01, 2017 and September 30, 2017, to identify barriers that prevented patients from self-monitoring of blood glucose (SMBG). No formal assessment of the patients' responses had been done, and, as a result, the deidentified, qualitative responses from the QIP were obtained for this project. The purpose of this project was to explore barriers to SMBG and to use a literature search to identify strategies for improving compliance with SMBG. The health belief model was the framework used to guide the project. Secondary data obtained from the QIP (n = 19) were analyzed and coded. Results indicated that patients' financial concerns, social support, emotional needs, and lack of diabetes education were the main barriers to daily SMBG. Recommendations to the providers were to consider each barrier before ordering the use and frequency of SMBG and to consider an appropriate strategy for promoting SMBG adherence. Addressing low compliance with SMBG may promote positive social change through improved T2DM management, self-care, adherence to daily SMBG and treatment, and improved patient quality of life.

Barriers to Daily Blood Glucose Monitoring in Type 2 Diabetes Mellitus

by

Sylvain N. Tientcheu

MS, Walden University, 2014

BS, Lamar University, 2010

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

Walden University

August 2018

Dedication

This doctorate project is dedicated to my dad and mom Pierre and Victorine Tientcheu who gave me the spirit and desire of higher achievement.

To my wife Susan Tientcheu who continually provide me with her unconditional moral, spiritual, emotional, and financial support to keep alive the spirit and desire of higher achievement.

To my children Brice, Arnold, Sonia, Dylane, Sharone, and Lovely Tientcheu who will receive and keep alive the spirit and desire of higher achievement.

.

Acknowledgments

I would like to express my deepest gratitude to my committee chair Dr. Janice Long for her unwavering guidance, support, and mentorship throughout this Doctor of Nursing Practice project, as well as to the Walden University faculties who offered me collegial guidance and support over the years: Dr. Andrea Jennings-Sanders, Dr. Diane Whitehead, and Dr. Alice Edith Conway.

I would like to extend my thanks to the staff who offered support and mentorship throughout this doctorate journey.

Table of Contents

List of Tables

List of Figures

Section 1: Introduction

Introduction

Scott (2014) estimated that 382 million people were affected by diabetes mellitus (DM) in 2013 and predicted a 55 % increase in affected individuals by 2035. Diabetes mellitus is the seventh leading cause of death in the United States (Loucks et al., 2016). Approximately 4 million deaths were attributed in 2010 from complication of DM such as myocardial infarction, stroke, kidney failure, blindness, and lower limb amputations (Scott, 2014).

The prevalence of Type 2 diabetes mellitus is on rise in the United States and affects minority ethnic and racial group disproportionally (Chow et al., 2012). Despite improvement of access to medical care, African Americans and Hispanic Americans have a higher prevalence and complication from DM compared with White Americans (Chow et al., 2012). For instance, 18.7% of all African Americans and 11.8% of Hispanic Americans aged 20 years and older have been diagnosed with diabetes compared with 7.1% of non-Hispanic White Americans. On the other hand, the risk of diabetes is 77% higher among African Americans, and 66% higher among Hispanic Americans than among non-Hispanic white Americans (Chow et al., 2012).

Blood glucose monitoring is the ongoing measurement of the level of the concentration of glucose in the blood to maintain consistent glucose levels, and home glucose monitoring is referred as self-monitoring of blood glucose (SMBG) (Whitmore, 2012). SMBG is one of the most important skills in diabetes self-management and

understanding and addressing barriers that prevent patients with T2DM to comply with SMBG may improve the patient adherence to SMBG.

Problem Statement

The practice setting identified for this project was a primary care practice clinic located in a large urban city in the southern United States. The clinic primarily serves African Americans and Hispanic Americans. One in two patients registered in the clinic had an active diagnosis of T2DM, and more than 60% of patients with T2DM had both hypertension and diabetes (Personal Communication, 2017). One in three patients with T2DM were treated with hypoglycemic drugs and insulin, and, as a result, they were required to monitor their blood glucose before self-injecting insulin. Seventy-five percent of the blood glucose logs given to patients to record their blood glucose were not filled out completely during their monthly follow-up appointment (Personal Communication, 2017). As a result, for effective management of the patient's medical condition, the providers at the clinic wanted to know the reason for their patients' low compliance to SMBG.

Osborn, Cavanaugh, Wallston, and Rothman (2010) stated that interventions to promote self-care activities such as blood glucose self-monitoring can control the level of hemoglobin A_{1C}. Loucks et al. (2016) suggested that patients should be educated toward behaviors that improve glycemic control such as blood glucose monitoring. Patients with T2DM are advised to monitor their blood glucose closely to avoid complications that can occur when blood glucose levels rise and damage the small nerves and blood vessels in the body. By controlling blood glucose, patients may reduce the risk of microvascular

and neurovascular complications that kill one individual with DM every 6 seconds (Yuncken, 2014). Although the diabetes management program at the practice site exist to help patients with T2DM monitor and control their blood sugar level on a day-to-day basis, many patients still do not monitor their blood glucose regular and as a result do not have adequate blood glucose control.

A lack of knowledge often drives patient preferences for certain diabetes management programs compared with others (Lopez et al., 2016). As a result, a clear understanding of patient preferences, needs, and values could facilitate the design of better patient-centered disease management programs that may result in improved patient participation, engagement, adherence, health outcomes, and quality of life (Lopez et al., 2016)

Purpose

Health care providers at the practice site educated patients with T2DM to check their blood glucose often and record the glucose meter reading in a blood glucose log. Follow-up visits were scheduled every 3 months. However, during the follow-up visit, the blood glucose logs given to patients to record their blood glucose level were not completed. As a result of the poor compliance to SMBG, the health care providers were relied solely on the value of the hemoglobin A_{1C} drawn every 3 months, to adjust medications for patients on insulin therapy. At this time, the hemoglobin A_{1C} (HbA_{1C}) is considered to be the most relevant physiologic outcome target of uncontrolled glycemia , because it indicates overall glucose control, and it is a proven risk predictor for diabetic microvascular complications (Nyomba et al., 2014). On the other hand, SMBG is

considered to be one of the most important skills in diabetes self-management and is the only method currently available that allows adjustments in insulin dosage during meal time and hours of sleep to control and adjust insulin or oral hypoglycemic medications, as well as to prevent impending hyperglycemic or hypoglycemic emergencies (Nyomba et al., 2014). Therefore, it was important that patients understood the value of SMBG and that providers understood the barriers that prevent patients from self-monitoring and recording their glucose levels in the home setting. As a result, the project question was: What barriers prevent patients with T2DM from self-monitoring their blood glucose as prescribed? The answer to this question may have addressed the gap in practice which was the lack of providers' knowledge about the raison that prevent patients with T2DM to SMBG

The purpose of this project was to examine barriers that prevent patients with T2DM from self-monitoring their blood glucose as prescribed and then to educate providers on strategies to improve patient monitoring. Addressing barriers to SMBG may help to achieve the following: (a) promote self-care, (b) improve patient adherence to SMBG and treatment, (c) improve the use and recording of blood glucose in logs provided by health care provider, (d) early detection of complications associated with uncontrolled hyper or hypo glycemia, (e) reduce financial cost associated with complications of diabetes, and (f) improve patient's quality of life.

Nature of the Doctoral Project

The nature of this quality improvement doctoral project was to identify barriers to SMBG and search for the best available evidence to overcome those barriers and to use

the knowledge gained to provide health care providers with strategies to improve patient compliance to SMBG. I searched the Walden University library databases CINAHL Plus with full text, PubMed, CINAHL & MEDLINE, and ProQuest for literature that explores barriers or problems related to patients with T2DM to SMBG. Literature of interest were peer-reviewed articles published between 2010 and 2017 using the Boolean operator *AND* with the following identified concepts: *hyperglycemia, SMBG, blood glucose self-monitor, fear, glycemic control, diabetes mellitus, blood glucose, blood sugar, barriers, self-testing, patient education, and health belief model.*

The clinic providers have documented barriers described by the patients on a separate form within the chart with no identifying data as part of a quality improvement project at the clinic from July 01, 2017, to September 30, 2017. I completed analysis of the retrospective deidentified data documented the practice of SMBG and patients' barriers to compliance for common themes similar to a qualitative method describing barriers to SMBG. Next, I identified barriers and used those barriers to conduct a literature review as a second level of evidence. I used key words from the types of barriers identified in the analysis of the deidentified chart data to identify published strategies for promoting SMBG. I provided a report containing the strategy for overcoming each barrier identified to the clinic medical director.

Whitmore (2012) suggested that SMBG is only useful when patients understand how, when, where, and why to test and what to do with the result, and on the other hand, providers will rely on the value of the HbA_{1C} taken every 3 months to adjust their treatment. $HbA_{1C,}$ as compared to SMBG, does not provide a clear picture of the patient

glucose level during fast and preprandial and postprandial time, which can trigger an adjustment in the patient's daily medication dose and frequency as well as lifestyle change.

Significance

T2DM affects disproportionally low-income groups, and program designed at reducing T2DM inequalities cost millions of tax payers' dollars each year (Chaufan, Constantino, & Davis, 2013). The outcome of this DNP project may help local stakeholders, community leaders, providers, nurses, dieticians, and health care policy makers to invest in a low cost-efficiency program aimed in reducing barriers to SMBG. Socioeconomic differences have been linked in disease and death rated difference in time from infectious diseases in the 18th and 19th centuries due to lack of sanitation, then to diseases of malnutrition due to insufficient calories, and this century to diseases of excess calories (Chaufan et al., 2013). T2DM, a metabolic disease, can be linked to the disease of excess calories consummation.

SMBG can help patients, family, and health care providers understanding what foods produce an abnormal increase in blood glucose during preprandial and postprandial time and adjust their diet accordingly. SMBG will provide patients as well as health care providers the opportunity to link the value of their blood sugar with the consummation of certain high calories with less nutritional value foods. Bodenheim and Grumbach (2016) pointed out that the food industry spends billions of dollars to advertise for foods, which most have poor nutritional value. The findings of this project will support improvement of the clinic providers' ability to address barriers that prevent patients to adhere to

recommended SMBG. As a result the clinic providers will empower patients by educating them on how, when, where, and why to test and what to do with the result in order to improve the patient self-care efficacy, self-confidence, quality of life, and a positive social change.

Summary

Many diabetes management programs exist to help patients with T2DM monitor and control their blood sugar level on a day-to-day basis and improve their health outcomes; however, a lack of knowledge exists about what drives patient preferences for certain diabetes management programs compared with others (Lopez et al., 2016). As a result, a clear understanding of patient preferences, needs, and values as related to SMBG could facilitate the design of better patient-centered disease management programs that may result in improved patient participation, engagement, adherence, health outcome, and positive social change (Lopez et al., 2016).

In Section 1, I presented the problem statement, the purpose, the nature of this doctoral project, and it significance, whereas in Section 2, I will develop the concepts, models, theoretical framework, the relevance to nursing practice, and my role as the DNP student.

Section 2: Background and Context

Introduction

A primary care practice clinic located in a large urban city in the southern United States that primarily serves African American and Hispanic Americans reported that one in two patients registered in the clinic had an active diagnosis of T2DM, and more than 60% of patients with T2DM had both hypertension and diabetes (personal communication, 2017). One in three patients with T2DM were treated with hypoglycemic drugs and insulin, and, as a result, they were required to monitor their blood glucose before self-injecting insulin. Seventy-five percent of the blood glucose logs given to patients to record their blood glucose were not accurately completed during their monthly follow-up appointment. As a result, the project sought to determine what barriers prevent patients with T2DM to SMBG daily. In Section 2, I will develop the concepts, models, theoretical framework, the relevance to nursing practice, and my role as the DNP student.

Concepts, Models, and Theories

In this project, I examined barriers that prevent patients with T2DM to self-monitor blood glucose daily using the health belief model (HBM) theory. HBM assumes that people fear disease, and that health actions are motivated by the degree of fear and the benefits obtained (McEwin & Wills, 2014). HBM has six constructs:

1. The first construct is perceived susceptibility which is the patient's opinion of chance of getting the disease (McEwin & Wills, 2014). Sharma (2011) estimated that people perception of getting any harmful condition vary from

deny to fear of acquiring the disease, and the likelihood of following preventive health behavior is associated to the degree of fear the person feels.

2. The second construct of HBM is perceived severity, which is the patient's opinion of how serious a condition and its sequelae are (McEwin & Wills, 2014). People have different perception of the extent of harm that can be caused by a disease. Some patients may be concerned by the medical aspect of the disease such as sign and symptoms, temporary limitation, permanent limitation, and death whereas other patients have a broader view such as the disease's outcomes on their family, job, and relationships (Sharma 2011)
3. The third construct of the HBM is perceived benefits, which is the patient's opinion on the efficacy of the advised action to reduce risk (McEwin & Wills, 2014) Sharma (2011) suggested that when patients known that there are available effective alternatives susceptible to reduce the severity of the condition, they are more likely to take action.
4. The fourth construct is perceived barriers, which is the patient's opinion of the tangible and psychological cost of the advised action (McEwin & Wills, 2014). The patient may consider the advised action to be expensive, inconvenient, unpleasant, painful, or upsetting to execute (Sharma 2011)
5. The fifth construct of the HBM is cues to action which are the diverse actions that will activate the readiness to act and stimulate other behaviors (McEwin & Wills, 2014). Sharma (2011) suggested that theses precipitation forces that push the patient to take action may be internal such as a perception of a bodily

state or external such as media, follow-up postcard from the doctor office, or interpersonal interactions

6. The sixth and final construct of the HBM is self-efficacy, which is the patient's confidence in the ability to successfully perform an action (McEwin & Wills, 2014). Sharma (2011) added that the action should be a specific and present behavior not a past or future one.

A schematic representation of the HBM from Sanders et al. (2013) study is shown in Figure 1:

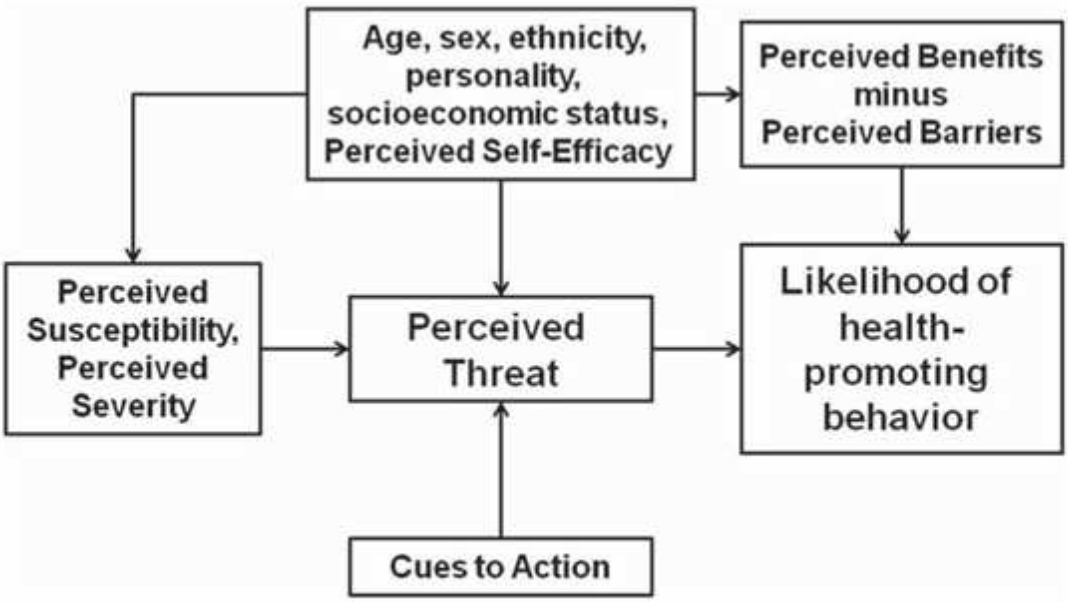

Figure 1. Schematic representation of the health belief model.

I used the perceived barriers of the HBM to help identify perceived barriers that prevent patients with T2DM to SMBG daily, and to propose interventions that may help improve compliance. The perceived barriers of HBM, which is the patient's opinion of the tangible and psychological cost of the advised action to SMBG (McEwin & Wills,

2014), resulted in identified barriers that prevent patient from adhering to the advised action of SMBG such as expensive, inconvenient, unpleasant, painful, or upsetting to execute (Sharma 2011)

Gucciardi et al. (2013) used the HBM in a semistructured interviews involving 12 participants from a community health center in Ontario, Canada, to examine the views and current practice of SMBG among Black Caribbean and South Asian individual with noninsulin-treated T2DM. Gucciardi et al. (2013) used HBM to explain and predict health behavior, assuming that patients will take recommended health-related action if they feel that they can successfully perform the action (self-efficacy), or they can avoid negative health condition by doing so (perceived severity).

Aghamolaei, Tavafian, and Madani (2011) used both HBM and the theory of planned behavior (TPB) to examine low adherence to helmet use among Iranian motorcycle drivers despite evidence that helmets use significantly reduced the likelihood of head and neck injuries during an accident. Aghamolaei et al. (2011) developed a self-administered questionnaire based on TPB and HBM six constructs and found that motorcycle drivers who perceived a high level of behavioral control, intention to use a motorcycle helmet, few barriers, high self-efficacy, and a high number of cues to action were the most likely to use a motorcycle helmet study.

Sanders et al. (2013) used the HBM to assess patients' low compliance with hearing aid despite evidence that suggests that hearing aids are effective treatment for patients with hearing deficit. Sanders et al. (2013) develop a hearing belief questionnaire (HBQ) based on the six constructs of HBM, and found that despite the fact that many

factors in common influence health behavior, HBM was an appropriate framework for examining and predicting hearing health behavior

Shojaei et al. (2016) used the HBM to assess the effects of the HBM-based educational program on the nutritional knowledge and behavior of CABG patient found that nutrition education based on HBM seems to be effective in improving nutritional knowledge, dietary behavior, perceived severity, and perceived benefit and barriers.

Relevance to Nursing Practice

Cost as Barriers to SMBG

Gucciardi et al. (2013) used the HBM to examine the views and current practice of SMBG among Black Caribbean and South Asian individual with noninsulin-treated T2DM. Gucciardi et al. (2013) used a thematic network analysis of NVivo 8 to analyze the different constructs of HBM as related to SMBG. This qualitative study revealed patients' acknowledgement of the benefit of SMBG and pointed out the cost of glucose meter and test strip as a main barrier to SMBG (Gucciardi et al., 2013). This research opens the door to further research on SMBG for noninsulin-treated patients while advising providers to consider patients clinical, financial, and social support before ordering the use and frequency of SMBG

Elgart, González, Prestes, Rucci, and Gagliardino (2016) used an observational retrospective study of 657 patients for more than 12 months to evaluate de frequency of SMBG and attainment of HbA_{1c} target values. Drugs and test strip used for 12 months and the different laboratory test results were analyzed. The study revealed a correlation between the increase in use and frequency of SMBG and the cost of test strip that

represented 50% of the total cost of the diabetes program with an attainment on HbA_{1c} target value, and patient self-management and empowerment (Elgart et al, 2016).

Patients' Emotion as Barriers to SMBG

Mehmet, Hussey, and Ibrahim (2015) conducted an interview of 76 randomly selected patient from the outpatient clinic of the Queen Mary's Hospital diabetes center, in the United Kingdom, to analyze their perceptions of injecting insulin and SMBG in the presence of others. Two main questions were asked about patients' level of comfort in self-injection insulin and self-monitoring blood glucose on front of others, and the feelings associated of doing so. A thematic analysis of the questionnaire revealed that patients across all ages, gender report problems with injecting insulin and SMBG in public and the work place. The study suggested that the heath care provider should identify patients psychological needs and emotional needs, and address them adequately in order to limit or avoid that patients develop a psychological resistance to insulin and SMBG (Metmet et al, 2015).

Lack of Diabetes Education

To determine where an association exists between diabetic education and improvement in glycemic control for patients newly diagnosed with DM, Weaver et al. (2014) used a retrospective cohort study of 16,410 adults aged 18 years and older residing in the Calgary Zone of Alberta Health Service in Canada from October 2005 to June 2008. Change in HbA_{1C} during a period of 6 to 18 months of patients who attended the Diabetes Essentials program within the first 6 months after diagnosis with those who did not attend was compared (Weaver et al., 2014). Diabetes Essential program is a free,

publicly funded introductory diabetes education that targets people newly diagnosed with DM. Weaver et al. (2014) used propensity score matching of Stata MP to examine the interaction between baseline HbA_{1c} and Diabetes Essentials participation. The study found that a brief introductory didactic diabetes education program among newly diagnosed diabetes was associated with a reduction in HbA_{1c} (Weaver et al., 2014). This study implies that a low-cost diabetes education program should be a part of any interventions plan of care of for patients newly diagnosed with T2DM to achieve a better glycemic control.

In a study to identify strategies to improve self-care management among low-income and minority group diagnosed with T2DM, Akohoue et al. (2015) used a mixed-method design with seven focus group discussion and written questionnaires to assess 17 adults patients aged 21 years and older with T2DM recruited from the Family Medicine Clinic (FMC) in Nashville, Tennessee, five caregivers of patients with T2DM, 14 physicians, and one nurse practitioner. At the conclusion of the study, Akohoue et al. (2015) found that diabetes education at the clinic was the most common agreed upon strategy among patients/caregivers and providers, and as a result suggest to improve patient-provider communication in discussing treatment goals and strategies

Edwards (2013) developed a quality innovation productivity and prevention (QIPP) model in United Kingdom to enhance engagement and education around SMBG in order to achieve glycemic control while controlling the cost associated to SMBG. A total of 1,187 patient with T2DM were identified and 718 patients participated in the 10-minutes consultation and education on SMBG guidelines. The new model was

successfully implemented by providers and patients with T2DM and resulted in better use and quality of SMBG, and cost saving. Edwards (2013) suggested that primary care provider should provide clear education and empower patients with diabetes to interpret their blood glucose reading

Johnson et al. (2014) conducted a retrospective pre-post analysis study at Balls Food Stores in Kansas City, to elicit the effects of a pharmacist-led diabetes self-management program on three key metabolic parameters such as glycosylated hemoglobin (HbA_{1c}), low-density lipoprotein cholesterol (LDL-C), and mean arterial blood pressure (MAP) among patients diagnosed with DM. Johnson et al. (2014) analyzed 65 eligible company employees and their dependents aged 18 years and older with a diagnosis of Type 1 or Type 2 diabetes from medical claims data between November 2008 and December 2012 among 183 patients who participated in the program. The program consisted of one-on-one 30 minutes of diabetic education related to healthy lifestyle, medication adherence, and blood glucose self-monitoring with the clinical pharmacists for an average of six visit during the year, and during each visit, the patient blood pressure, blood sugar, and weight were collected (Johnson et al , 2014). A statistical analyze of the three key metabolic parameters such as HbA_{1C}, LDL-c, and MAP from baseline to one year were statistically significant, and the glycemic control was achieved (Johnson et al, 2014). A close collaboration between providers and clinical pharmacists about key metabolic parameters of patients with T2DM can improve diabetes education and patient adherence to glycemic control.

Lack of Social Support as Barriers to SMBG

Costa, Pereira, and Pedras (2012) conducted a study of 179 patients with T2DM selected from several health centers in the North of Portugal, using a multidimensional diabetes questionnaires, revised summary of diabetes self-care activities scales, and planned behavior questionnaire to assess partner support, social-cognitive variables and their role in adherence to SMGB. Pearson's correlation coefficient was used to analyze relationship among social-cognitive variables, spousal support and adherence, a multiple regression analysis was conducted to assess the best predictors of adherence. The study revealed a positive relationship among social-cognitive variables, spousal support, and adherence to SMBG and glycemic control. Partner support shows to be determinant in diabetes self-care, and as a result, health care providers should include partners in patients' plan of care (Costa et al, 2012)

The literature revealed cost, patients 'emotions, lack of social support, and lack of diabetes education as barriers to SMBG.

Previously Used Strategies and Standard Practice.

Meetoo, McAllister, and West (2011) suggested that SMBG provide a very helpful complement to HbA_{1c}, because it can reveal which aspects of glycemic control are most problematic between the fasting, preprandial or postprandial, and signaling the need to change or adjust therapy to improve glycemic control. Holt (2014) suggested that the frequency of SMBG should be prescribed on an individual basis, but it is only by monitoring blood glucose level on a regular basic that patterns and trends in glycemic control can be identified and treated. Whitmore (2012) suggested that SMBG is an

important and effective tool in the management of diabetes, and it is only useful only when the result of monitoring are acted upon by educating patient on how, when, where, and why to test and what to do with the result

Local Background and Context

The practice setting for this project was a primary care practice clinic located in a large urban city in the southern United States that primarily serves African American and Hispanic Americans. One in two patients registered in the clinic had an active diagnosis of T2DM. One in three patients with T2DM was treated with hypoglycemic drugs and insulin, and as a result, they were required to monitor their blood glucose before self-injecting insulin. Seventy-five percent of the blood glucose logs given to patients to record their blood glucose were not filed completely during their monthly follow-up appointment. As a result, the provider relied solely on the value of the HbA_{1c} drawn every 3 months, for patients on insulin therapy, to adjust their medications. The purpose of the project was to examine barriers that prevent patients with T2DM to SMBG daily.

Definitions of Terms

Chronic disease: A disease state that is long lasting or recurrent (Medlineplus, 2016).

Clinical practice guidelines: A set of recommendations made by recognized authorities regarding the screening, diagnosis, treatment, and management of specific conditions (White & Dudley-Brown, 2012).

Diabetes: A disease in which blood glucose, or blood sugar levels, are too high (Medlineplus, 2016)**.**

Diabetic nephropathy: A kidney disease or kidney damage often occurs through time in people with diabetes (Medlineplus, 2016)**.**

Diabetic peripheral neuropathy: A nerve damage that occurs in people with diabetes by decreased blood flow and a high blood sugar level (Medlineplus, 2016).

Glucose: A sugar that comes from the foods that one eats (Medlineplus, 2016).

Glycosylate hemoglobin (A_{1C}): A lab test that shows the average level of blood sugar (glucose) over the previous 3 months (Medlineplus, 2016).

Health literacy: Health literacy is defined as the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions (AHRQ, 2010).

Insulin: A hormone that helps the glucose get into your cells to give them energy (Medlineplus, 2016)**.**

Metabolic syndrome: A group of condition such as high blood pressure, high blood sugar, high level of triglycerides that puts an individual at risk for heart disease and diabetes (Medlineplus, 2016).

Self-monitor blood glucose (*SMBG)*: A glucose monitoring at home (Whitmore, 2012.

The prevalence of T2DM is on rise in the United States and affects minority ethnic and racial group disproportionally (Chow et al., 2012). Despite improvement of access to medical care, African American and Hispanic American have a higher prevalence and complication from DM compared with Whites. For instance, 18.7% of all African American and 11.8% of Hispanic American aged 20 years and older have been

diagnosed with diabetes compared with 7.1% of non-Hispanic White Americans. On the other hand, the risk of diabetes is 77% higher among African Americans, and 66% higher among Hispanic Americans than among non-Hispanic white Americans (Chow et al., 2012).

Role of the DNP Student

. Patients with T2DM at the clinic where this project took place were not compliant with SMBG during their follow-up appointment. Patients with T2DM on insulin therapy were required to monitor their blood glucose before self-injecting insulin. Three in four of the blood glucose logs given to patients to record their blood glucose were not filled completely during their monthly follow-up appointment. I contacted the clinic physician to discuss the issue and we decided as part of a quality improvement project at the clinic to document the reason that prevents patients from SMBG. This documentation began in July 2017 and is a routine part of the clinic visit with patients with T2DM.

As a result, the clinic providers documented patient compliance with daily SMBG at each patient visit. The providers also documented barriers to any noncompliance of SMBG. This information was maintained on a separate form with no identifying data within the patient chart and was provided to me for review after IRB approval was obtained. I reviewed the data and summarized the percentage of patients who were noncompliant as well as identified themes related to barriers to daily self-monitoring.

Summary

The literature review reveals that multiple barriers exist to SMBG present in all socioeconomic, age group, gender, and ethnic racial group of patients with T2DM. The

literature identifies cost, patients' emotions, lack of social support, and lack of diabetes education as barriers to SMBG.

Section 3: Collection and Analysis of Evidence

Introduction

The prevalence of T2DM is on rise in the United States and affects minority ethnic and racial group disproportionally. Despite improvement of access to medical care, African American and Hispanic American have a higher prevalence and complication from DM compared with Whites (Chow et al., 2012). SMBG is considered to be one of the most important skills in diabetes self-management and is the only method currently available that allows adjustments in insulin dosage during meal time and hours of sleep to control and adjust insulin or oral hypoglycemic medications, as well as to prevent impending hyperglycemic or hypoglycemic emergencies (Nyomba et al., 2014). The purpose of this project was to explore barriers to noncompliance with SMBG at a primary care clinic and make recommendations to improve compliance.

The literature review revealed multiple barriers to SMBG related to cost, patients' emotions, lack of diabetes education, and lack of social support. It was not known which barriers were common at the practice site and, therefore, I identified those barriers and then searched the literature to identify strategies for overcoming similar barriers. A report containing the strategy for overcoming each barrier identified was provided to the clinic medical director. In Section 3, I will restate the practice focus question, identify the source of evidence used to address the problem of low compliance to daily SMBG, and describe the system used for analyzing the evidence.

Practice-Focused Question

The practice setting for this project was a primary care practice clinic located in a large urban city in the southern United States that primarily serves African American and Hispanic Americans. At the clinic one in two patients had an active diagnosis of T2DM, and more than 60% of patients with T2DM had both hypertension and diabetes. One in three patients with T2DM was treated with hypoglycemic drugs and insulin, and as a result, they were required to monitor their blood glucose before self-injecting insulin. Seventy-five percent of the blood glucose logs given to patients to record their blood glucose were not filed completely during their monthly follow up appointment. As a result, for an effective management of the patient's medical condition, the providers at the clinic wanted to know the reason of low compliance to SMBG.

In this project, my purpose was to explore barriers that prevent patients to comply with the recommended daily SMBG and to make recommendations to the providers on how to improve compliance. The project question was: What barriers prevent patients with T2DM to SMBG daily?

Sources of Evidence

Upon approval from Walden IRB, I obtained a letter of cooperation and approval from the clinic medical director to give me the deidentified data from the patients' chart that contain their narrative of SMBG compliance that was previously obtained by the clinic providers as part of a quality improvement project at the clinic. I read the patient's narrative looking for repeated ideas or patterns of thought using concepts from the fourth construct of HBM, the perceived barriers and the review of literature to classify the

information for common themes describing barriers to SMBG daily and make recommendations based on current evidence on how to improve compliance. A second level of evidence came from a literature review after the barriers were identified. I used key words from the barriers to identify published strategies for promoting SMBG given the types of barriers identified in the analysis of the deidentified chart data.

Participants

The providers in the clinic had interviewed and documented the patients' responses on a separate form with no identifying data within the patient chart during their routine follow-up appointment, consistent with the quality improvement project for the clinic that started in July 2017. To reach data saturation and gain insight into low compliance to SMBG while taking into consideration the number of patients diagnosed with T2DM, the clinic medical director provided me with the deidentified data from twenty four patients 'charts randomly chosen to provide for data saturation with an identification code from P1 to P24. The retrospective deidentified data documented the practice of SMBG and patients' barriers to compliance from July 01, 2017. to September 30, 2017. Five patients who answered positively that they performed SMBG daily were excluded, and 19 patients' questionnaires were given a new identification code from P1 to P19.

After barriers were identified, a report containing the strategy for overcoming each barrier was provided to the clinic.

Procedures

As a part of a quality improvement project at the clinic, and during each encounter with a patient diagnosed with T2DM, and on insulin therapy, the clinic providers had documented the response to the following three questions only on a separate form within the chart with no identifying data. Those three questions were selected among the questions that are routinely asked during follow-up visit about the patient daily SMBG compliance, "Do you check your blood sugar every day? If no, how often do you check your blood sugar? And tell us what prevents you from checking your blood sugar every day?" Upon approval from Walden IRB, a letter of cooperation and approval was obtained from the clinic to get access to the deidentified patients' narrative of their SMBG behavior. A reading of the patients' narrative of the reason that prevent them to SMBG daily allowed me to identify repeated ideas or patterns of thought using concepts from the fourth construct of HBM the perceived barriers, which is the patient's opinion of the tangible and psychological cost of the advised action (McEwin & Wills, 2014), and can be expensive, inconvenient, unpleasant, painful, or upsetting to execute (Sharma, 2011). I reviewed each deidentified data and grouped them according to the themes related to barriers to daily self-monitoring revealed by the review of literature and the HBM. I also summarized the percentage of patients who are noncompliant. For instance, the literature review revealed that there are multiple barriers to SMBG related to cost, patients' emotions, lack of diabetes education, and lack of social support. This thematic analysis allowed me to identify similar and/or different patterns and themes from the review of literature and make recommendations based on current evidence on

how to improve compliance to SMBG at the clinic. The retrospective deidentified data documented the practice of SMBG and patients' barriers to compliance from July 1, 2017 to September 30, 2017.

After obtaining the information about the barriers that the patients present for low compliance to SMBG, a report containing the strategy for overcoming each barrier identified was provided to the clinic medical director.

Protection

The clinic providers used a form documenting SMBG practices and barriers to compliance with providers' recommendations. The providers documented barriers described by the patients on a separate form within the chart with no identifying data to insure data security and anonymity as a part of a quality improvement project at the clinic. The clinic provided a letter of cooperation and approval. Upon approval from Walden IRB the forms completed by the clinic providers from the quality improvement project were provided to me with a clinic identification number from Patient 1 (P1) to Patient 24 (P24). Five patients who answered positively that they performed SMBG daily were excluded, and 19 patients' questionnaires were given a new identification code from P1 to P19

Analysis and Synthesis

A reading of each patient with T2DM narrative of the reason that prevented them from SMBG daily, previously obtained during their routine follow-up visit with the clinic providers, allowed me to identify repeated ideas or patterns of thought using a thematic coding, concepts from the HBM, and the review of literature. I read each deidentified

data and group them according to the themes related to barriers to daily self-monitoring revealed by the review of literature and the HBM. I reported the findings by listing all types of barriers that were identified using thematic coding and the frequency of their occurrence as well as the percentage of patients who were noncompliant. I provided a report for the clinic medical director that identified strategies to overcome identified barriers. For instance, the literature review revealed that there are multiple barriers to SMBG related to cost, patients' emotions, lack of diabetes education, and lack of social support. This retrospective thematic analysis of patients' narrative allowed me to identify patterns and themes that prevent them to SMBG daily. The retrospective deidentified data documented the practice of SMBG and patients' barriers to compliance from July 01, 2017, to September 30, 2017. The results of this project are specific to the setting where the project took place and because of the small sample size and the open ended questions, the results cannot be transferred to other settings.

Summary

The literature review revealed that there are multiple barriers to SMBG present in all socioeconomic, age group, gender, and ethnic racial groups of patients with T2DM The literature revealed cost, patients' emotion, lack of social support, and lack of diabetic education as deterrents to daily SMBG. In the next section of this project, I will report the findings that resulted from analysis and synthesis of the collected data and the identify recommended solutions to improve SMBG compliance

Section 4: Findings and Recommendations

Introduction

The practice setting for this project was a primary care practice clinic located in a large urban city in the southern United States that primarily serves African Americans and Hispanic Americans. One in three patients with T2DM was treated with hypoglycemic drugs and insulin, and, as a result, they were required to SMBG before self-injecting insulin. Of the blood glucose logs given to patients to record their blood glucose, 75% were not filled out completely during their monthly follow-up appointment (Personal Communication, 2017). As a result, for medical management of the patient's condition, the providers relied solely on the value of the HbA_{1C} drawn every 3 months.

SMBG is one of the most important skills in diabetes self-management and is the only method currently available that allows adjustments in insulin dosage during meal time and hours of sleep to control and adjust insulin or oral hypoglycemic medications, as well as to prevent impending hyperglycemic or hypoglycemic emergencies (Nyomba et al., 2014). For an effective management of the patient's medical condition, the providers at the clinic wanted to know the reason for low compliance to SMBG as part of the implementation of the quality improvement project. The project question to address the gap in practice was: What barriers prevent patients with T2DM from daily SMBG as prescribed? In this project, my purpose was to identify barriers that prevent patients from complying with the recommended daily SMBG and to provide the clinic with a report containing strategies to overcome those barriers.

Upon receipt of Walden IRB approval number 04-26-18-0375805, I received a letter of cooperation and approval from the clinic medical director who gave me the deidentified data from patients' chart. The data included the narrative of SMBG compliance previously obtained by the clinic providers as part of a quality improvement project at the clinic between July 01, 2017, and September 30, 2017. I received 24 responses of patient's narrative with a clinic identification number form patient number one (P1) to patient number 24 (P24). Five patients who answered positively that they performed SMBG daily were excluded, and 19 questionnaires were attributed a new identification number from P1 to P19. I identified themes that prevents patients from SMBG daily based on the theory of the HBM by completing thematic coding using Microsoft word Comments and Macros.

Findings and Implications

Data Analysis

I completed thematic coding by conducting a constant comparison across each response on the questionnaires, and each response was edited with Microsoft Word (Table 1). I familiarized myself with the data by reading the transcripts of the 19 patient responses to the third question of the clinic quality improvement project questionnaire repeatedly to identify key ideas and recurrent themes that were highlighted and coded using Microsoft Word Comments. The analysis focused solely on areas deemed relevant to the project question and the codes identified were consistent with those reported in the literature found in previous research. The codes were: cost of health care, lack of diabetes education, testing frequently evokes an emotional response, and lack of social support.

After the themes and codes were identified, the next step was to extract only those themes and codes to a new document using Microsoft Word Macros. The Macro program used was created by Fredborg (2013), and it extracted the data into a new Microsoft Word table with five columns. For each Comment (code), the table showed the page number, the text that was highlighted and commented (scope), the comment itself, the name of the author who inserted the comment and the date when the comment was added (Fredborg, 2013). I modified the original version to have a six-column table which included the patient identification code. The thematic coding and analysis of the 19 responses using Microsoft Word Macros revealed 24 codes that were transferred to Microsoft Excel to arrange the codes in alphabetic order. The last step was to select only the three columns of the table that were relevant to the data analysis, and to replace their original name in the macro program by an explicit denomination. For instance, Column B (line) was replaced by patient ID number, Column C (comment scope) was replaced by patient's response to questionnaire, and Column D (comment text) was replaced by thematic coding (see Table 2).

Table 1

Transcript of Patients' Responses to the Third Question of the Clinic QIP Questionnaire

Patient ID number	Patients' responses
1	The pain is too much.
2	My work schedule and I cannot check it at work.
3	No meter or test strip.
4	Work.
5	Just the inconvenience of it. I feel it is a waste of time Especially if I'm in a rush in the morning. It takes up too much time.
6	I can feel when my blood sugar is high or low then I check.
7	It is embarrassing. I don't want people to know I'm diabetic.
8	It has been good number. When it is higher I check more often, until lower again.
9	Forget.
10	I'm afraid of the result.
11	My numbers have been good.
12	I don't feel it is helping, my blood sugar will always rise after meal.
13	I don't know what to do with the result.
14	Sometimes I'm just lazy to do it.
15	Needle stick is painful.
16	It hurt when I checked.
17	My diabetes is not too serious.
18	I don't just understand why I need to check more often.
19	I don't have enough test strip, and it is expensive.

Table 2

Thematic Coding

Patient ID number	Patients' responses to questionnaire	Thematic coding
19	I don't have enough test strip, and it is expensive.	Cost of self-care.
3	No meter or test strip.	Cost of self-care.
6	I can feel when my blood sugar is high or low then I check.	Lack of diabetes education.
11	My numbers have been good.	Lack of diabetes education.
12	I don't feel it is helping, my blood sugar will always rise after meal.	Lack of diabetes education.
13	I don't know what to do with the result.	Lack of diabetes education.
17	My diabetes is not too serious.	Lack of diabetes education.
18	I don't just understand why I need to check more often.	Lack of diabetes education.
8	It has been good number. When it is higher I check more often, until lower again.	Lack of diabetes education.
7	I don't want people to know that I'm diabetic.	Lack of social support.
9	Forget.	Lack of social support.
14	Sometimes I'm just lazy to do it.	Lack of social support.
7	It is embarrassing.	Testing is embarrassing (emotion).
5	Just the inconvenience of it.	Testing is inconvenient (emotion).
15	Needle stick is painful.	Testing is painful (emotion).
1	The pain is too much.	Testing is painful (emotion).
16	It hurts when I checked.	Testing is painful (emotion).
2	My work schedule.	Testing is time conflicting (emotion).
5	It takes up too much time.	Testing is time consuming (emotion).
5	I feel it is a waste of time Especially if I'm in a rush in the morning.	Testing is time wasting (emotion).
6	A waste of time.	Testing is time-consuming (emotion).
2	I cannot check it at work.	Testing produces workplace conflict (emotion).
4	Work.	Testing produces workplace conflict (emotion).
10	I'm afraid of the result.	Testing result produces fear (emotion).

Frequency

The 24 codes revealed that low adherence to SMBG was related to the cost of supplies. Three of the 24 codes revealed that low adherence to SMBG was related to the lack of social support. Seven of the twenty-four codes revealed that low adherence to SMBG was related to the lack of diabetes education. Twelve out of twenty-four codes revealed that low adherence to SMBG was related to patients' emotions.

Unanticipated Limitation

Only two out of twenty-four codes revealed that low adherence to SMBG was related to the cost of supplies. It is possible that because only one response was coded, barriers to SMBG may have been under-reported. On the other hand, in my opinion barriers reported by patients with T2DM were likely to be those most important that prevent them to SMBG.

Implication

The findings suggested that patients' financial, social support, emotional needs, and diabetes education may be important elements to consider before ordering the use and frequency of SMBG. Health care providers may find that including a partner in the patients' plan of care, providing a clear diabetes education, and empowering the patient with T2DM to interpret their blood glucose reading may improve daily SMBG. Behavioral psychology predicts that negative experiences with SMBG prompt patients to avoid it as much as possible, and as a result for those who express fear of self-testing or fear of pain, the Diabetes Fear of Injecting and Self-testing Questionnaire (D-FISQ) can

be used to assess the level of anxiety and the need for psychotherapy (Snoek, Malanda, & Wit, 2008)

Collaboration among the entire diabetes care community is needed to facilitate the design of better patient-centered disease management programs that will ensure that monitoring is performed and used to its fullest advantage which may result in improved patient participation, engagement, adherence, health outcomes, and quality of life.

Recommendations

The following recommendations were provided to the clinic medical director, after a careful analysis and synthesis of the literature for each identified barrier. Before ordering the use and frequency of SMBG, heath care provider may consider to identify patients 'psychological and emotional needs, clinical, financial, and social support. For instance, Metmet et al. (2015) suggested that heath care provider could identify patients 'psychological needs and emotional needs and address them adequately in order to limit or avoid that patients develop a psychological resistance to insulin and SMBG while Gucciardi, et al. (2013) advised providers to consider patients clinical, financial, and social support before ordering the use and frequency of SMBG.

Overcoming Cost of Self-Care

Health care providers (HCP) should assess the patients' clinical and financial needs before ordering the use and frequency of SMBG. Gucciardi, et al. (2013) advised providers to consider patients clinical, financial, and social support before ordering the use and frequency of SMBG. HCP should ensure that the glucose meters prescribed to patients with T2DM are compatible with the testing strips covered under the lowest tier

formulary of their health plans or encourage them to seek out glucose monitoring kits that use the lower cost testing strips. For instance, Gomes et al. (2010) suggested that even a modest change in the frequency of SMBG could lead to substantial cost reduction and unnecessary use of blood glucose test strips. Xie, Agiro, Bowman, and DeVries (2017) suggested that cost sharing that falls below 20% of testing strip costs can facilitate persistent self-monitoring, particularly among patients with poor glycemic control

Overcoming Lack of Social Support

HCP should include partners or family's members in patients' plan of care and refer patients to a diabetes support group. For instance, Costal et al. (2012) suggested that patients who perceive positive support from partners are more likely to develop an action and coping plan to overcome obstacles and constraints regarding SMBG. Lopez et al. (2016) suggested that patient with T2DM who are specifically referred to online or printed material by their HCP have a positive view and perception of HCP as being supportive and engaged, and therefore are more likely to share their hopes and goals, and to follow the recommended self-care behavior. Naderimagham et al. (2012) suggested that self-care behavior such as SMBG could not be achieved by patients with T2DM unless they received appropriate social support from HCP and families, and when patients received informational, emotional and instrumental support, they showed improved self-care behavior. Ong, Chua, and Ng (2014) suggested that HCP should encourage and facilitate support network to optimize SMBG use, and on the other hand, supporting patient emotionally or financially empowers them to be active in their self-care.

Overcoming Lack of Diabetes Education

HCP should provide clear education and communication on the different purposes of SMBG, the treatment goals and strategies, and empower patients to interpret their blood glucose reading, and to recognize the symptom of abnormal glycemic. HCP should refer patients to a diabetes self- management education (DSME) program. For instance, Whitmore (2012) suggested that SMBG is an important and effective tool in the management of diabetes, and it is only useful when the result of monitoring is acted upon by educating patient on how, when, where, and why to test and what to do with the result. Akohoue et al. (2015) found that diabetes education at the clinic was the most common agreed upon strategy among patients/caregivers and providers, and as a result suggest to improve patient-provider communication in discussing treatment goals and strategies. Edwards (2013) suggested that primary care provider should provide clear education and empower patients with diabetes to interpret their blood glucose reading. Snoek et al. (2008) suggested that accurate symptom awareness and recognition when combined with experimentation can help reinforce the need to check BG levels. Stetson et al. (2011) suggested that SMGB is an integral element in diabetes self-management education and training (DSME/T) and have been successfully applied with good outcomes across multiple settings. Group diabetes education has been shown to increase adherence to SMBG and should be considered (Ong et al., 2014)

Overcoming Patients' Emotion

HCP should remind patients that SMBG is a means to an end, not a goal in itself, avoid interpreting BG values as failures, be sensitive to the anxiety that surround SMBG

result, teach alternative site testing, and offer the Diabetes Fear of Injecting and Self-testing Questionnaire (D-FISQ) for determining the level of anxiety and the need for psychotherapy. For instance, Snoek et al. (2008) suggest that teaching patients to avoid interpreting SMBG values as failures leads to a less negative opinion and more frequent testing, and for those who express fear of self-testing, offer them the Diabetes Fear of Injecting and Self-testing Questionnaire (D-FISQ) for determining the level of anxiety and the need for psychotherapy. For those who express fear of practicing SMBG in front of other people Ong et al. (2014) suggested counseling and peer support group referral while suggesting alternative site testing such as arm, abdomen, and thigh or the use of the lateral side of the finger for those who express anxiety over the use of needle and pain.

Strengths and Limitations of the Project

The results of this project are specific to the setting where the project took place. This project was conducted in an urban area, where participants have easy access to health care facilities. Therefore, the findings may not be applicable to other settings where health care services are more limited. The barriers to diabetes care questions were open-ended and prone to under-reporting, and additionally, because of the small sample and only one response was coded, it is possible that barriers may have been under-recorded. On the other hand, it was my opinion that barriers reported by patients with T2DM were likely to be those most important that prevent them to SMBG.

Section 5: Dissemination Plan

The purpose of this quality improvement evaluation project was to identify barriers that prevent patients with T2DM to SMBG and to provide to the clinic strategies to overcome the barriers based on current evidence, in other to help the clinic to improve compliance to SMBG. A PowerPoint report or presentation that includes identified barriers, and strategies and recommendations to overcome the barriers to SMBG, will be provided to the clinic. The literature revealed that overcoming barriers to SMBG is a multidisciplinary approach that involves health care providers, patients and family members, nurses, and diabetes educators, and as a result a forum through the American Association of Diabetes Educators (AADE) is a suitable mean of dissemination as well as a publication to the journal of the American Diabetes Association (ADA), and the ANA journal known as *American Nurse Today*.

Analysis of Self

My first job as a registered nurse in 2009 was in the home health care organization, and as a home health nurse, patient education was a key component of my job description. The home health care environment shaped my early experience with patient non-adherence to home monitoring of blood glucose known as SMBG. As a nurse practitioner and primary care provider since 2014, I encountered patients with chronic diseases seeking medical attention, and I provided them the best care at my level of training, knowledge, and education. In 2015, I enrolled in the doctor of nursing practice (DNP) program in pursuit of higher education. During the practicum activity, I was reviewing patients' charts when I realized that the blood glucose log given to the

patient with T2DM to record their home monitoring of blood glucose was not filled out completely. The clinic providers decided to initiate a quality improvement project to understand the reasons that prevent patients with T2DM to adhere to the recommended SMBG. DNP graduates must be proficient in quality improvement strategies and in creating and sustaining changes at the organizational and policy level (AACN, 2006). As a postgraduate student, I plan to continue serving my population as their primary care provider focusing in applying evidence-based practice I gained from my project as related to overcoming barriers to SMBG. I will use a multidisciplinary approach when needed with patient with T2DM. I will use the same strategy to overcome barriers that prevent patients with chronic diseases to adhere to any recommended self-care behavior in my clinic.

Researching the literature to identify barriers that prevent patient with T2DM to SMBG was challenging and complex. I used different databases with different combinations of key words to find the literature of interest. The experience I gained during the process of literature review helped me during the thematic coding of the patient's response to the questionnaire. Researching the literature to overcome identified barriers give me more insight and cues to action about developing a holistic and individual strategies that may help providers improve adherence to SMBG.

Summary

SMBG is one of the most important skills in diabetes self-management and understanding and addressing barriers that prevent patients with T2DM to comply with SMBG may improve the patient adherence to SMBG and health outcome. The analysis of

the quality improvement project deidentified data given to me by the medical director of the clinic revealed that barriers that prevent patient with T2DM to SMBG were the cost of the supply, the lack of social support, the lack of diabetes education, and the patient's emotion. The following recommendations were provided to the clinic: (a) Before ordering the use and frequency of SMBG, the heath care provider (HCP) may consider to identify patients 'psychological and emotional needs, clinical, financial, and social support; (b) the HCP may consider to provide clear education and communication on the different purposes of SMBG, the treatment goals and strategies, and empower patients to interpret their blood glucose reading, and to recognize the symptom of abnormal glycemic; (c) the HCP may consider to ensure that the glucose meters prescribed to patients with T2DM are compatible with the testing strips covered under the lowest tier formulary of their health plans, or encourage them to seek out glucose monitoring kits that use the lower cost testing strips; (d) the HCP may consider to refer patients to a diabetes self- management education (DSME) program or diabetes support group; (e) the HCP may consider to remind patient that SMBG is a means to an end, not a goal in itself, avoid interpreting BG values as failures; (f) the HCP may consider to be sensitive to the anxiety that surround SMBG result, teach alternative site testing; and (g) the HCP may offer the Diabetes Fear of Injecting and Self-testing Questionnaire (D-FISQ) for determining the level of anxiety and the need for psychotherapy (Snoek et al., 2008). Collaboration among the entire diabetes care community is needed to facilitate the design of better patient-centered disease management programs that will ensure that monitoring

is performed and used to its fullest advantage which may result in improved patient participation, engagement, adherence, health outcomes, and quality of life.

References

Aghamolaei, T., Tavafian, S., & Madani, A. (2011). Prediction of helmet use among Iranian motorcycle drivers: An application of the health belief model and the theory of planned behavior. *Traffic Injury Prevention*, *12*(3), 239-243. doi:10.1080/15389588.2011.557757

Agency for Healthcare Research and Quality. (2010). Health literacy: Hidden barriers and practical Strategies. Retrieved from http://www.ahrq.gov/professionals/quality-patient-safety/quality-resources/tools/literacy-toolkit/tool3a/index.html

Akohoue, S. A., Patel, K., Adkerson, L. L., & Rothman, R. L. (2015). Patients', caregivers', and providers' perceived strategies for diabetes care. *American Journal of Health Behavior 39*(3). 433-440. doi:10.5993/AJHB.39.3.15

American Association of Colleges of Nursing (AACN). (2006). The essentials of doctoral education for advanced nursing practice. Retrieved from http://www.aacn.nche.edu/dnp/Essentials.pdf

Bodenheimer, T., & Grumbach, K. (2016). *Understanding health policy: A clinical approach* (7th ed.). New York, NY: McGraw-Hill Medical.

Chaufan, C., Constantino, S., & Davis, M. (2013). 'You must not confuse poverty with laziness:' A case study on the power of discourse to reproduce diabetes inequalities. *International Journal of Health Services*, *43*(1), 143-166. doi:10.2190/hs.43.1.j

Chow, E. A., Foster, H., Gonzalez, V., & McIver, L. (2012). The disparate impact of diabetes on racial/ethnic minority populations. *Clinical Diabetes*, *30*(3), 130-133. doi :10.2337/diaclin.30.3.130

Costa, V., Pereira, M. G., & Pedras, S. (2012). Partner support, social-cognitive variables and their role in adherence to self-monitoring of blood glucose in type 2 diabetes. *European Diabetes Nursing*, *9*(3), 81-86. doi:10.1002/edn.212

Edwards, R. (2013). Structured educational model for SMBG: A model for primary care delivery. *British Journal of Healthcare Management*, *19*(11), 526-530. doi :10.12968/bjhc.2013.19.11.526 :

Elgart, J. F., González, L., Prestes, M., Rucci, E., & Gagliardino, J. J. (2016). Frequency of self-monitoring blood glucose and attainment of HbA1c target values. *Acta Diabetologica*, *53*(1), 57-62. doi:10.1007/s00592-015-0745-9

Fredborg, L. (2013). Extract comments to new document. DocTools. Retrieved from https://www.thedoctools.com/word-macros-tips/word-macros/extract-comments-to-new-document/

Gomes, T., Juurlink, D., Shah, B., Paterson, J., Mamdani, M., Gomes, T., & . . . Mamdani, M. M. (2010). Blood glucose test strips: options to reduce usage. *Canadian Medical Association Journal*, *182*(1), 35-38. doi:10.1503/cmaj.091017

Gucciardi, E., Fortugno, M., Senchuk, A., Beanlands, H., McCay, E., & Peel, E. E. (2013). Self-monitoring of blood glucose in Black Caribbean and South Asian Canadians with non-insulin treated Type 2 diabetes mellitus: A qualitative study

of patients' perspectives. *BMC Endocrine Disorders*, *13*(1), 46-64. doi:10.1186/1472-6823-13-46

Holt, P. (2014). Blood glucose monitoring in diabetes. *Nursing Standard*, *28*(27), 52-58. doi:10.7748/ns2014.03.28.27.52.e650

Johnson, C., Ruisinger, J. F., Bates, J., & Barnes, B. J. (2014). Impact of a community-based diabetes self-management program on key metabolic parameters. *PharmacyPractice*,*12*(4), 499. doi :10.432.s1886-36552014000400009

Lopez, J. S., Katic, B. J., Fitz-Randolph, M., Jackson, R. A., Wing, C., & Mullins, C. D. (2016). Understanding preferences for type 2 diabetes mellitus self-management support through a patient-centered approach: a 2-phase mixed-methods study. *BMC Endocrine Disorders*, *16*1-11 11p. doi:10.1186/s12902-016-0122-x

Loucks, E. B., Gilman, S. E., Britton, W. B., Gutman, R., Eaton, C. B., & Buka, S. L. (2016). Associations of mindfulness with glucose regulation and diabetes. *American Journal Of Health Behavior*, *40*(2), 258-267. doi:10.5993/AJHB.40.2.11. Retrieved from http://library.waldenu.edu

MedlinePlus (2016). Diabetes and nerve damage. Retrieved from https://medlineplus.gov/ency/article/000693.htm

Meetoo, D. D., McAllister, G., & West, A. (2011). Assessing glycemic control: self-monitoring of blood glucose. *British Journal Of Nursing*, *20*(15), 919-925.

Mehmet, S., Hussey, C., & Ibrahim, S. (2015). Patients' perceptions of injecting insulin and self-monitoring of blood glucose in the presence of others. *Practical Diabetes*, *32*(2), 59-63.doi:10.1002/pdi.1925

McEwin, M., & Wills, E.M. (2014). *Theoretical basis for nursing*. (4th. ed.). Philadelphia, PA: Wolters Kluwer Health.

Naderimagham, S., Niknami, S., Abolhassani, F., Hajizadeh, E., & Montazeri, A. (2012). Development and psychometric properties of a new social support scale for self-care in middle-aged patients with type II diabetes (S4-MAD). *BMC Public Health*, *12*1035. doi:10.1186/1471-2458-12-1035

Nyomba, B., Berard, L., & Murphy, L. (2004). Facilitating access to glucometer reagents increases blood glucose self-monitoring frequency and improves glycemic control: a prospective study in insulin-treated diabetic patients. *Diabetic Medicine*, *21*(2), 129-135.

Ong, W. M., Chua, S. S., & Ng, C. J. (2014). Barriers and facilitators to self-monitoring of blood glucose in people with Type 2 diabetes using insulin: a qualitative study. *Patient Preference and Adherence*, *8*237-246. doi:10.2147/PPA.S57567

Osborn, C., Cavanaugh, K., Wallston, K., & Rothman, R. (2010). Self-efficacy links health literacy and numeracy to glycemic control. *Journal Of Health Communication*, *15*146-158. doi:10.1080/10810730.2010.499980. Retrieved from http://library.waldenu.edu

Sanders, G. H., Frederick, M. T., Silverman, S., & Papesh, M. (2013). Application of the health belief model: Development of the hearing beliefs questionnaire (HBQ) and its associations with hearing health behaviors. *International Journal of Audiology*, *52*(8),558-567. doi:10.3109/14992027.2013.791030

Sharma, M. (2011). Health belief model: Need for more utilization in alcohol and drug education. *Journal Of Alcohol & Drug Education*, *55*(1), 3-6.

Scott, L. (2014). Empagliflozin: A review of its use in patients with Type 2 diabetes Mellitus. *Drugs*, *74*(15), 1769-1784. doi:10.1007/s40265-014-0298-1. Retrieved from http://library.waldenu.edu

Shojaei, S., Farhadloo, R., Aein, A., & Vahedian, M. (2016). Effects of the health belief model (HBM)-based educational program on the nutritional knowledge and behaviors of CABG patients. *Journal Of Tehran University Heart Center*, *11*(4), 181-186.

Snoek, F., Malanda, U., & de Wit, M. (2008). Self-monitoring of blood glucose: Psychological barriers and benefits. *European Diabetes Nursing*, *5*(3), 112-115.

Stetson, B., Schlundt, D., Peyrot, M., Ciechanowski, P., Austin, M. M., Young-Hyman, D., & ... Sherr, D. (2011). Monitoring in diabetes self-management: Issues and recommendations for improvement. *Population Health Management*, *14*(4), 189-197. doi:10.1089/pop.2010.0030

Weaver, R. G., Hemmelgarn, B. R., Rabi, D. M., Sargious, P. M., Edwards, A. L., Manns, B. J. & ... James, M. T. (2014). Association between participation in a brief diabetes education programme and glycaemic control in adults with newly diagnosed diabetes. *Diabetic Medicine*, *31*(12), 1610-1614. doi:10.1111/dme.12513

Whitmore, C. (2012). Blood glucose monitoring: an overview. *British Journal of Nursing*, *21*(10), 583-587.

White, K. M., & Dudley-Brown, S. (2012). *Translation of evidence into nursing and health care practice.* New York, NY: Springer

Xie, Y., Agiro, A., Bowman, K., & DeVries, A. (2017). Lowering cost share may improve rates of home glucose monitoring among patients with diabetes using insulin. *Journal of managed care & specialty pharmacy*, *23*(8), 884-891.

Yuncken, J. (2014). Barriers to implementing change within diabetes care. *Wound Practice & Research*, *22*(1), 50-55. Retrieved from http://library.waldenu.edu