Promoting Self-Care Management in Type 2 Diabetes: Interactive DM Group Education

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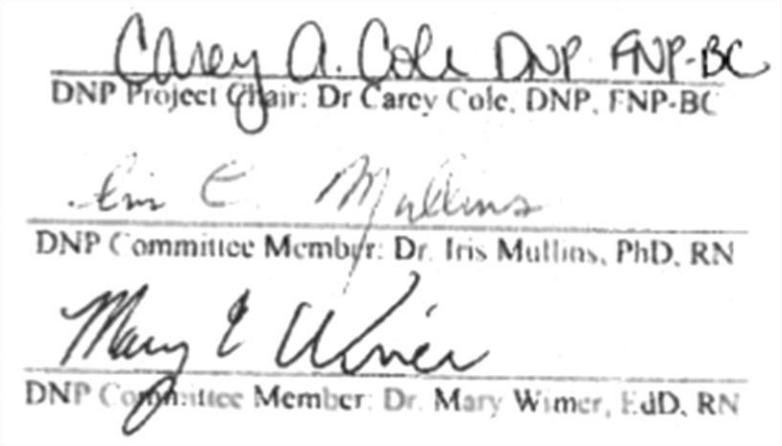

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Abstract

Diabetes has become a growing, global health concern. Researchers and healthcare providers are continuously implementing new interventions to help reduce the prevalence and complications of this disease. The purpose of this study was to evaluate the effect of a telehealth-based, interactive diabetes educational group on attitudes and knowledge in adults with type 2 diabetes. Research has demonstrated that proper diabetes maintenance has helped reduce long-term complications of type 2 diabetes.

This study used a paired *t*-test, descriptive and frequency statistics, and Cronbach's alpha statistical analyses to evaluate if the participants in this study demonstrated improved scores on the Diabetes Self-Management Questionnaire (DSMQ) after a telehealth educational session. Systematic literature reviews were conducted in this project to provide an overview of management processes in adults >18 years with type 2 diabetes with a focus on individuals with poor glycemic control. Meta-analyses, randomized-control trials (RCTs), and a cohort study were reviewed. Inclusion criteria for this study were adults ages 18 years and older, English-speaking, patients of Northern Virginia Internal Medicine and Pediatrics, with a diagnosis of type 2 diabetes (hemoglobin A1c [HbA1c] level greater than or equal to 6.5%).

The telehealth-based educational peer support group sessions demonstrated an improvement in overall DSMQ scores in the following categories 1) sum scale, 2) dietary control, 3) glucose management, and 4) physical activity. There was no statistical significance in DSMQ scores after the telehealth education session.

Keywords: diabetes, adults, HbA1c, diet, physical activity, weight loss, glycemic control, education, interactive, self-management, peer support, telehealth, knowledge

DEDICATION

To my parents, with a special thank you to my mom, Clara Enyinnaya. Thank you for believing in me, supporting me, and praying with me throughout this long journey. To my siblings, best friends, and colleagues. Thank you for your patience, your presence, and valuable time spent with me through this entire process. I truly appreciate and love all of you.

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CHAPTER I

INTRODUCTION

Promoting Self-Care Management in Type 2 Diabetes: Interactive DM Group Education

Caring for individuals who are affected by diabetes has become a healthcare burden in the United States healthcare system. There are four main types of diabetes: 1) type 1 diabetes, 2) type 2 diabetes, 3) gestational diabetes, and 4) secondary diabetes (Egan & Dinneen, 2019). Type 1 diabetes results from a destruction of pancreatic B-cells, leading to insulin deficiency, which causes hyperglycemia, or elevated blood glucose. Type 2 diabetes results from pancreatic B-cell dysfunction and insulin resistance, which can lead to hyperglycemia. Gestational diabetes results from carbohydrate intolerance in women who are pregnant. This type of diabetes may resolve in the postpartum stage, but often places these women at an increased risk for type 2 diabetes in the future. Lastly, secondary diabetes results from associated conditions such as pancreatic disease, corticosteroid hormone excess, or it can be chemically or drug-induced, leading to hyperglycemia. A clinical diagnosis of diabetes is indicated by 1) a fasting blood glucose >126 mg/dL, 2) a 2-hour (or random) plasma glucose >200 mg/dL, or a glycated hemoglobin (HbA1c) >6.5% (Egan & Dinneen, 2019). For the purpose of this research project, the primary focus will be type 2 diabetes.

According to the 2020 *National Diabetes Statistics Report*, over 34.2 million individuals in the United States have diabetes (Centers for Disease Control and Prevention [CDC], 2020). Of the 34.2 million individuals with diabetes, approximately 26.9 million individuals were diagnosed. According to the CDC, approximately 7.3 million individuals with diabetes were either unaware of their diagnosis or failed to report their diagnosis. Studies have indicated that type 2 diabetes is responsible for 90-95% of diabetes cases (CDC, 2020). According to the

Virginia Department of Health (VDH), 631,194 individuals living in the state of Virginia have diabetes, with 2.1 million individuals with prediabetes (VDH, 2018). According to the American Diabetes Association (ADA), 84 million individuals living in the Unites States have prediabetes (ADA, 2018). In the United States, American Indians/Alaskan Natives have the highest prevalence of diabetes (14.7%), followed by Hispanics (12.5%), non-Hispanics Blacks (11.7%), non-Hispanic Asians (9.2%), and non-Hispanic Whites (7.5%) (CDC, 2020).

In the United States, diabetes is currently the seventh leading cause of death per year (CDC, 2020). In 2017, approximately 277,000 deaths were attributed to diabetes (ADA, 2018). Of those deaths, 85,000 listed diabetes as the primary cause. Of the 689,000 cardiovascular disease deaths, 111,000 deaths were attributed to diabetes. Of the 150,000 cerebrovascular disease deaths, 42,000 were attributed to diabetes. Of the 72,000 renal disease deaths, 39,000 were attributed to diabetes (ADA, 2018).

In 2017, the medical expenses for diabetes in the United States averaged a total of $327 billion (CDC, 2020). As of 2018, the medical expenses for diabetes in the United States averages a total of $16,752 per individual each year, a 26% increase over the last 5 years (ADA, 2018). Annual medical expenses for individuals with diabetes are 2.3 times greater than an individual without a diagnosis of diabetes (ADA, 2018). These increasing healthcare costs associated with diabetes should encourage healthcare providers to educate diabetic patients on the risk factors, maintenance, and consequences of diabetes to improve disease management.

Significance of Study

The management of type 2 diabetes is a significant health concern for healthcare providers worldwide. Many of the associated risk factors such as smoking, sedentary lifestyle, excess weight, uncontrolled hypertension, elevated cholesterol levels, and elevated glucose

levels can be improved through clinical management (CDC, 2020). Poor management of these risk factors can contribute to long-term healthcare complications. Individuals with diabetes are often hospitalized for comorbid conditions such as ischemic heart disease, cerebrovascular accident, diabetic ketoacidosis, hypoglycemia or hyperglycemic crisis, kidney disease, and lower extremity amputation. Many of these complications can result in death if not managed properly (CDC, 2020). Now that we have encountered the COVID-19 pandemic, it is essential for individuals with diabetes to have alternative options to managing their health and limiting their exposure to a potential deadly virus. This study allowed adults with type 2 diabetes to obtain necessary diabetes education through a telehealth-based platform, thus preventing the spread of COVID-19.

Purpose of Study

The purpose of this study was to evaluate the effect of a telehealth-based, interactive diabetes educational group on attitudes and knowledge about diabetes in adults with type 2 diabetes. The intervention group received information on glucose control, information on self-management skills, and a peer group support session. A paired *t*-test study was performed to determine the effects of the interventions planned for this project. The goal of this project was to enable residents in the Northern Virginia area with type 2 diabetes to improve diabetes self-management. The role of the Doctor of Nursing Practice (DNP) student researcher was to operate within a multidisciplinary team of healthcare members to educate and develop patient-focused care plans for the participants in this study.

Research Question: In adults with type 2 diabetes, how does a telehealth-based, interactive diabetes educational group session improve attitudes toward and knowledge of diabetes?

Theoretical Framework

The theoretical framework that was used for this project is Prochaska and Diclemente's Transtheoretical Model of Change (TTM) of 1982. This model was developed to help understand how individuals process change, and the tools used to attain his or her goals (Prochaska et al., 1994). There is a total of six stages of change 1) precontemplation, 2) contemplation, 3) preparation, 4) action, 5) maintenance, and 6) termination (Prochaska et al., 1994). The goal of this DNP project was to ensure the participants of this study start the process of progression through the six stages of change at completion of the telehealth-based, interactive diabetes program. The DNP student researcher is aware of the possibility that study subjects may move forward or move backward along the continuum of the stages.

The first stage of the TTM is precontemplation. During this stage, the individual is usually in denial and has no intention of making any changes (Prochaska et al., 1994). In an individual with poor glycemic control, the person will not acknowledge that he or she has an elevated HbA1c. He or she does not believe it is a problem, and therefore will have no intention of creating a plan to gain better glycemic control.

In the second stage of the contemplation, the individual understands that there is a problem and begins to think about a resolution goal to attain within the next 6 months (Prochaska et al., 1994). Here, the individual acknowledges that an elevated HbA1c is an issue and wants to make a change within the next 6 months but has not committed to any changes or taken any steps towards a change.

During the third stage of the TTM, preparation, the individual intends to make a change within the next 30 days (Prochaska et al., 1994). The individual with uncontrolled diabetes may set a nearby date on when he or she plans to begin eating healthier or talking small walks

outside. This individual may also make small changes such as keeping a food diary or decrease the amount of unhealthy food intake.

The fourth stage of the TTM is action. In this stage, overt behavioral modifications are made (Prochaska et al., 1994). During this time frame, the individual with diabetes is now only purchasing healthy foods to eat and has developed a daily exercise routine. Family members and friends will begin to notice changes made by the individual during this stage as well.

In the fifth stage of the TTM, maintenance, the individual will recognize the progress made during the previous 6 months, maintain it, and prevent a relapse (Prochaska et al., 1994). The individual with uncontrolled diabetes may notice that he or she lost a few pounds during the action stage by eating healthy and exercising, so he or she will continue the same behaviors to prevent relapse. The individual may also incorporate new changes to maintain the progress made thus far in the cycle (Prochaska et al., 1994).

In the sixth and final stage of the TTM, termination, the individual has reached the goal of change; the feeling of temptation to return to old habits will no longer exist (Prochaska et al., 1994). The individual with diabetes will have reached the goal of complete improved attitudes and knowledge about diabetes, glycemic control, eating healthier, losing weight, and maintaining those long-term goals of achievement.

Research Question/Null Hypothesis

Research Question

What is the effect of a telehealth-based, interactive diabetes educational group session on the attitudes and knowledge of individuals with type 2 diabetes?

Null Hypothesis (H_0)

There will be no effect on the attitudes and knowledge of type 2 diabetics using telehealth-based, interactive diabetes educational groups.

CHAPTER II

INTEGRATED REVIEW OF LITERATURE

The literature review was conducted using the Cumulative Index to Nursing and Allied Health Literature (CINAHL), Directory of Open Access Journals (DOAJ), and ScienceDirect databases. Keywords searched were "telehealth diabetes," "self-care AND diabetes management, type 2," "diabetes type 2 and exercise," "diabetes type 2 intervention," and "diabetes and mortality". Parameters set were full-text, peer-reviewed, English-written journal articles published after 2013 with the exception of the ADA (2002) seminole study that set the standard of care for diabetes management. These articles were reviewed for relevance and inclusion in this proposal. Among those, systematic reviews and randomized controlled trials were selected. Articles were included if they met the following criteria: 1) adults ages 18 years and older, and 2) clinical diagnosis of type 2 diabetes. Individuals who are unable to participate in physical activity recommendations were excluded from the search. The search was then narrowed down to a total of 15 articles, which were used in this study.

Knowledge Learning Aspect of Self-Care Management Education

***Learning Methods for Self-Management Education*.** The increasing prevalence of diabetes has led to research on preventative measures and glycemic control studies in healthcare. Diabetes self-management education has been a key factor in the treatment of many individuals affected by type 2 diabetes (Adam et al., 2018). Adam et al. (2018) conducted a randomized controlled study to evaluate and compare the effectiveness of two diabetes self-management educational methods on glycemic control, and patient knowledge, attitudes, and behaviors (KABs) of adults with type 2 diabetes. The two educational methods evaluated were diabetes conversation maps (CMs) and traditional group education (TE). CMs allowed for visual

interactive learning by using diabetes self-management educational-based images and symbols to promote participant conversations regarding clinical, behavioral, and psychological issues. TE focused on diabetes self-management PowerPoint lectures presented by registered dieticians and registered nurses. After each session, the presenters allowed participants time for questions and answers (Adam et al., 2018).

Inclusion criteria of the study were 1) adults ages 19 to 65 years old, 2) physician diagnosis of type 2 diabetes within the past 5 years, 3) lack of diabetes education, and 4) proficiency in English (Adam et al., 2018). Individuals with mental health or psychosocial issues, inability to provide consent, and limited education (below the eighth grade level) were excluded from the study. A total of 100 participants were screened for the study. After inclusion and exclusion criteria was applied, a final number of 21 patients were randomly assigned to the two different groups. Ten individuals were assigned to the CM group and 11 individuals were assigned to the TE group (Adam et al., 2018).

Patient knowledge, attitudes, and behaviors were evaluated at the 2-week, 4-week, and 3-month marks after 2-hour educational sessions using the Diabetes Knowledge Test and the Diabetes Attitude Scale questionnaires (Adam et al., 2018). Laboratory HbA1c values were collected prior to the start of the study and 3 months after both educational methods were received. Pretest and posttest designs were used to evaluate the outcome of the interventions on HbA1c values and KABs. Results of the study demonstrated that patients in both the CM group and TE group had a significant decrease in HbA1c values which were (1.29%; $p < .05$) and (0.76%; $p < .05$) respectively. After the 2-week educational session, there was a significant increase in knowledge in the CM group ($p = 0.0023$) and an insignificant increase in knowledge in the TE group ($p = 0.06$). After the second educational session, there were no changes in

knowledge ratings between the CM group and the TE group ($p = 0.15$). After the 3-month visit, there was a significant increase in attitude scores of individuals in the CM group in comparison to the attitude scores of the individuals in the TE group ($p = 0.015$) (Adam et al., 2018). One limitation of the study was the small sample size. An increase in the sample size would allow for better representation of the population. Another limitation of the study was the length of the study. Researchers believed that an increase in the length of the study would allow the participants to have more time to determine how they would benefit from within a diabetes self-education program (Adam et al., 2018).

***Intensive and Structured Series of Education*.** Mohamed et al. (2013) conducted a randomized controlled study to evaluate the effect of culturally sensitive, patient-centered educational programs on the self-management practices of Arabians with type 2 diabetes. Inclusion criteria were 1) Arabian adults residing in Qatar, 2) diagnosis of type 2 diabetes, and 3) patients of primary healthcare centers and the Main General Hospital. Exclusion criteria were patients with type 1 diabetes, and those with a history of alcohol or drug abuse. A total of 430 participants were randomized into the intervention group ($n = 215$) or the control group ($n = 215$). The participants of the intervention group underwent four interactive, educational sessions (3-4 hours each), which focused on diabetes education, healthy eating, physical activity, and counseling. Individuals in the control group were given a diabetes educational toolkit for self-management (Mohamed et al., 2013).

Patient outcomes included baseline and 12-month post-study values of height and weight, blood pressure, and biochemical and hematological measures (HbA1c, fasting plasma glucose, total cholesterol, high-density lipoprotein [HDL] cholesterol, low-density lipoprotein [LDL] cholesterol, triglycerides, and albumin/creatinine ratio) (Mohamed et al., 2013). The Mann-

Whitney *U*-test was used to analyze the differences in means between both groups. Results of the study showed that individuals in the intervention group had a significant reduction in HbA1c values (-0.55mmol/L; $p = .012$), fasting plasma glucose (−0.92 mmol/L, $p = 0.015$), body mass index (1.70, $p = .001$), and albumin/creatinine ratio (-3.09, $p < 0.0001$). There was no statistical difference between the intervention and control groups regarding the biochemical measures of total cholesterol, triglycerides, and systolic blood pressure (Mohamed et al., 2013). Limitations of the study were 1) high attrition rate, 2) failure to measure modifying variables (dietary intake, physical activity, and medication adjustments), and 3) failure to assess effect of complementary and alternative therapy usage on the study outcomes (Mohamed et al., 2013).

Individual vs. Group Sessions and Glycemic Control. In Sweden, the management of type 2 diabetes is often the responsibility of healthcare practitioners and diabetes specialist nurses (DSNs) (Jutterström et al., 2016). Each year, DSNs meet to review national guidelines for diabetes and focus on ways to improve treatment measures with a focus on self-management methods. Jutterström et al. (2016) piloted a randomized control study to evaluate the effects of nurse-led and patient-focused self-management education on metabolic control in type 2 diabetes. Inclusion criteria for the study were 1) type 2 diabetes diagnosis within 3 years, 2) adults aged 40-80 years old, 3) Swedish speaking, and 4) absence of cognitive or other severe illnesses. All patients were recruited from the community-based primary health centers' electronic record system (Jutterström et al., 2016).

A total of 182 patients were selected and randomized in three different groups: group intervention (GI) ($n = 63$), individual intervention (II) ($n = 34$), and internal control (IC) ($n = 34$) (Jutterström et al., 2016). An external control (EC) group ($n = 51$) was established in a primary health center in a different county to control for external factors such as unintended positive

consequences. The EC group consisted of recruited members using the same criteria as the GI, II, and IC groups. Patient in the GI and II groups attended six diabetes workshops (45-90 minutes each) over the course of 6 months. Individuals in the GI group participated in group sessions with one diabetes nurse, while participants in the II group met one-on-one with a diabetes nurse. Patients in the IC and EC control groups received routine care, which included one to two office visits a year. Each diabetes workshop focused on patients' understanding of diabetes and patient-centered, diabetes self-management (Jutterström et al., 2016).

This study took place over the course of 5 years with a baseline data collection and annual data collection every 12 months (Jutterström et al., 2016). The data collected included variables such as body mass index, waist circumference, blood pressure, and cholesterol levels with the primary outcome being HbA1c values. The one-way ANOVA, Pearson chi-square, paired *t*-test, and Fisher's tests were used to analyze the differences between the three randomized groups. The results of the study demonstrated there was a significant decrease in the HbA1c level in the GI group ($p < .001$, $n^2 = .34$) and the II groups ($p = .004$, $n^2 = .23$). There was a difference in total cholesterol levels between the GI and IC groups ($p = 0.007$). Among the individual versus group session, the individual group session was more effective in controlling HbA1c levels. There was no statistical significance in the baseline and post-study values of the IC and EC group in HbA1c reduction and no changes in other metabolic parameters (Jutterström et al., 2016). Limitations of the study were 1) uneven number of participants in each group, 2) 56% participant acceptance rate, 3) higher participant dropout rate in GI group in comparison to the II group, 4) significant different in baseline HbA1c levels between groups, and 5) failure to register study protocol for project (Jutterström et al., 2016).

Psychological Aspect of Self-Care Management Education

Psychological Aspect in Education Style, Perception of Adherence in Self Care Management, and Glycemic Control. Researchers suggest that self-care activities can contribute to better glycemic control in type 2 diabetes. In 2013, Fall et al. performed a randomized controlled study to evaluate the effect of psychological intervention on acceptance, adherence, and motivation in type 2 diabetes treatment. The researchers believed that threat-based interventions were more likely to have a better effect on glycemic control than mastery-based interventions. Inclusion criteria in the study were adult patients with type 2 diabetes who were on either oral or insulin diabetes medications. Individuals who had personality disorders or were not fluent in French were excluded from the study. Individuals were randomly recruited from a single inpatient and outpatient hospital setting over the course of a 4-month period in France. The final sample of participants were 80 Caucasians with type 2 diabetes (Fall et al., 2013). The two intervention groups had 20 participants each (total of $n = 40$) who underwent a perception of mastery (recall a time when they were able to control their diabetes) or threat (recall a time when they felt threatened by their diabetes) in the management of their diabetes. The two control groups had 20 participants each (total of $n = 40$) who underwent a perception of positive emotion recall (recall a positive event in their life) and negative emotion recall (recall a negative event in their life) (Fall et al., 2013).

Cognitive and emotional variables were evaluated using the Brief Mood Introspection Scale, Common-Sense Model, and Self-Determined Model (Fall et al., 2013). Each individual's perception, adherence, acceptance, and motivation in treatment of diabetes were measured using the Brief Illness Perception Questionnaire, Medication Adherence Questionnaire, Acceptance and Action Diabetes Questionnaire, and the Treatment Self-Regulation Questionnaire

respectively. The ANOVA and Pearson chi-square tests were used to analyze the comparison of the groups. Results of the study demonstrated that individuals who felt they had more control over their diabetes were less likely to have negative emotions than individuals who did not (control group) (Fall et al., 2013). Limitations of the study were 1) failure to obtain baseline diabetes perceptions of participants, 2) limited generalizability of study findings due to modest sample size, and 3) potential for biased adherence ratings due to measurement via self-reported questions related to social desirability (Fall et al., 2013).

The presence or lack of diabetes education may have an effect on the psychosocial status and glycemic control in an individual (Chai et al., 2018). Chai et al. (2018) conducted a randomized controlled study in China to evaluate the effect of self-management diabetes education on psychosocial factors (anxiety and depression) and glycemic control in newly diagnosed type 2 diabetics. Inclusion criteria of the study were the following: 1) Chinese ethnicity, 2) adults older than 18 years of age, 3) recent diagnosis of type 2 diabetes, and 4) currently being treated with oral diabetes medication. Individuals who were pregnant, nursing, had a diagnosis of liver/kidney disease, or a history of psychotic disorders were excluded from the study. This resulted in a total of 118 participants in the study. Participants in the control group (n = 55) only received 5-10 minutes of general diabetes education during regular office visits, and participants in the education group (n = 63) received 2-hour weekly, interactive sessions on diabetes self-management (Chai et al., 2018).

The Self-Rating Anxiety Scale and the Self-Rating Depression Scales were used to evaluate changes in anxiety and depression levels before the study began and 6 months after (Chai et al., 2018). Laboratory fasting blood glucose (FBG), postprandial blood glucose (PBG), and HbA1C values were measured prior to the start of the study and at the 6-month mark as well.

Results of the study concluded that in comparison with the control group, the participants in the education group had a significant decrease in anxiety (36.00 vs. 42.50; $p < .05$) and depression levels (35.50 vs. 44.00; $p < .05$) after 6 months. HbA1C values in the education group (6.20 vs. 6.70; $p < .01$) also demonstrated a significant decrease in comparison to the control group (Chai et al., 2018). Limitations of the study were 1) failure to consider how exercise intensity and dietary regimen may affect outcomes, 2) absence of income and mental health evaluation of patients, and 3) failure to evaluate blood glucose level relationship to severity of mental health components (Chai et al., 2018).

Peer Support and Glycemic Control. Healthcare providers often have limited time during office visits for diabetes self-management education. Peimani et al. (2018) conducted a randomized controlled study in Tehran, Iran to evaluate the effect of peer-led diabetes self-management groups on self-care behaviors and quality of life. Inclusion criteria were 1) Iranian adults between the ages of 25 and 75 years old, 2) diagnosis of type 2 diabetes for longer than 12 months, 3) continuous care at the clinic for 6 months, and 4) telephone access. Individuals were excluded if they had any medical condition that would prevent them from participating in the study or performing self-care measures. A total of 200 patients participated in the study. Initially, both groups underwent four educational sessions that reviewed key factors of diabetes, healthy diet, weight control, and management of diabetes. The intervention group ($n = 100$) held monthly, interactive educational sessions that allowed them to discuss their concerns, problems, and solutions for the effect of diabetes on their everyday lives. Individuals in the control group received generalized diabetes education without peer support groups (Peimani et al., 2018).

Outcomes of the study were HbA1c values, self-care activities (measured by the Diabetes Self-Management Questionnaire), self-efficacy (measured by the Self-Efficacy Scale), and

quality of life (measured by the Health-Related Quality of Life questionnaire) (Peimani et al., 2018). Results of the study showed that individuals in the peer support intervention group had a significant decrease in mean HbA1c values (p = .045). Self-care, self-efficacy, and quality of life scores showed a significant improvement (p <.001) in the intervention group as well (Peimani et al., 2018). There were no limitations noted in this study.

Behavioral Aspects of Self-Care Management Education

Self-Monitoring & Behavioral Change Focused Lifestyle Modification Intervention.

In 2002, the Diabetes Prevention Program (DPP) Research Group conducted a randomized clinical trial to evaluate whether lifestyle modifications or pharmacological therapy was more effective in preventing or delaying the onset of diabetes (ADA, 2002). Inclusion criteria in the study were individuals with impaired glucose tolerance, individuals with increased risk for diabetes, range of low to high levels of education, and within Caucasian, African American, Hispanic American, American Indian, and Asian American ethnic groups (ADA, 2002).

There was a total of 3,234 participants in the study (ADA, 2002). The intervention group (n = 1,079) underwent a 16-session lifestyle intervention curriculum that focused primarily on weight control (7% weight loss and maintenance), exercise (minimum of three times a week for a total of 150 minutes or more), and nutrition (reduce caloric intake). Individuals in the intervention group were closely monitored on a weekly basis by lifestyle coaches, and individuals with expertise in physical activity, nutrition, and behavior. Results of the study concluded that individuals in the lifestyle intervention group were 58% more likely to prevent the incidence rate of diabetes (ADA, 2002). There were no limitations noted in this study.

Lifestyle interventions such as increased physical activity and improved nutritional diet have demonstrated positive effects on the management of diabetes (Gamiochipi et al., 2016).

Gamiochipi et al. (2016) conducted a randomized control study in Mexico to evaluate the effects of intensive lifestyle changes in metabolic control in type 2 diabetes. A total of 199 individuals recruited from eight Family Medicine Units in Mexico City participated in the study. The intervention group (n = 104) consisted of individuals who underwent intensive lifestyle modifications. The control group (n = 95) consisted of individuals who received collaborative education (Gamiochipi et al., 2016).

The research design of this study involved two different curricula that consisted of 16 weekly sessions taught by certified health professionals (Gamiochipi et al., 2016). The intervention group curricula focused on behavioral changes as a result of self-monitoring, healthier eating habits, and increased physical activity. The control group curricula focused on increased self-control and decision-making in management of diabetes based on knowledge provided (pathophysiology, diet, exercise, foot care, emotional and stress relief measures). ANOVA and ANCOVA tests were used to analyze and compare weight loss and laboratory HbA1c values. These variables were measured at the baseline, 3 months, and 6-month marks of the trial. Results of the study demonstrated that participants in the intervention had a significant decrease in body weight (26.1% vs. 13.6%) and HbA1c values (-2.2% vs. 1.76%) in comparison to participants in the control group (Gamiochipi et al., 2016). Limitations of this study were 1) small sample size, and 2) lack of clinical input from general family practitioners on diabetes education (Gamiochipi et al., 2016).

Self-monitoring of blood glucose has demonstrated effectiveness on glycemic control in individuals with type 2 diabetes (Machry et al., 2018). Machry et al. (2018) conducted a systematic review and meta-analysis to determine the short-term and long-term effects of glucose self-monitoring in diabetic patients. Multiple databases and published abstracts were searched

with an end range of July 2017. The studies that were selected were randomized clinical trials with type 2 diabetes patients that participated in self-monitoring versus control groups that had no standard care or regulated measurements. Studies that included regular blood glucose monitoring in both the intervention and control groups and intensive insulin treatment studies were excluded (Machry et al., 2018).

A total of 824 studies were originally identified for the meta-analysis; however, only 24 studies were included in the quantitative synthesis (Machry et al., 2018). A quality assessment was performed using the Cochrane Collaboration tool to evaluate risk of bias. The primary outcome was measurement of HbA1c. These values were measured at 12 weeks, 24 weeks, and one year after the beginning of the study. A statistical analysis was done using the Cochrane Q, I-square test (I^2), random effects model, funnel plots, and the Begg and Egger tests on Stata version 12.0. Results of the meta-analysis concluded that individuals who participated in self-monitoring blood glucose interventions had better glycemic control at the 12-week and 24-week mark than individuals in the control group. However, there was no difference in HbA1c level between the intervention group and the control group at the one-year mark (Machry et al., 2018). A limitation of the meta-analysis is differences in participants' frequency of self-monitoring of blood glucose within each group. Another limitation of the meta-analysis is the lack of control within the control group due to the mixture of studies found with no intervention. A third limitation is it was the first systemic review to evaluate self-monitoring of blood glucose for patients with an insulin treatment regimen (Machry et al., 2018).

***Weight Management and Diabetes Remission*.** Studies have demonstrated that type 2 diabetes has a positive correlation with weight gain and the accumulation of fatty tissue around the pancreas and liver (Lean et al., 2018). Lean et al. (2018) conducted a randomized clinical

study in Scotland and England that evaluated the effect of weight loss on diabetes remission. Inclusion criteria were 1) adults between the ages of 20 and 65 years old, 2) type 2 diabetes diagnosis within the last 6 years, 3) body mass index of 27-45 kg/m^2, and 4) HbA1c value greater than 6%. Individuals who were: on insulin, had an HbA1c value of 12% or more, weight loss of five kg in the past 6 months, decreased glomerular filtration rate (<30 mL/min), unstable heart failure or cancer, and those participating in another clinical study were excluded from the study (Lean et al., 2018).

A total of 306 adult patients were recruited from general practices (Lean et al., 2018). Participants in the intervention group followed a strict weight management program—Counterweight Plus—over the course of 12 months, which focused on physical activity and healthy eating (Lean et al., 2018). The control group focused on diabetes guidelines. The primary goals for both groups were weight loss of 15 kg or more, diabetes remission, and HbA1c values <6.5% after discontinuation of anti-diabetic medications. Weight and HbA1c values were collected prior to and 12 months after the study. Results of the study demonstrated that 24% of participants in the intervention group lost 15 kg or more. There was no significant weight loss in the control group. Diabetes remission occurred in 46% of participants in the intervention group and 4% of participants in the control group (p <.001) (Lean et al., 2018). Limitations of the study were 1) different racial and ethnic characteristics (e.g., body composition), which could influence outcomes, 2) potential bias due to participants knowing which group they are allocated to prior to beginning the study, 3) withdrawal of antidiabetic medications in intervention group but not in the control group, 4) 25% participant dropout rate in intervention group, 5) lack of physical activity data review, and 6) rescue plans for several individuals who gained weight within the first 60 days of the study (Lean et al., 2018).

Post-Meal Exercise versus Regular Once-a-Day Exercise and Glycemic Control. Along with the incorporation of diabetes medications, key measures in the treatment of diabetes focus on healthy diet and exercise. Pahra et al. (2017) conducted a randomized cross-over study in India to evaluate the effect of post-meal exercise (after breakfast, lunch, and dinner) versus daily exercise on glycemic control in type 2 diabetes. A total of 64 participants were included in the study. Group A (n = 32) involved adult individuals who did post-meal exercises, and Group B (n = 32) involved adult individuals who exercised once a day. All patients were on a form of oral antidiabetic medication and used fitness wrist bands to monitor their physical activity. They also received daily telephone reminders to exercise and check their blood glucose levels (Pahra et al., 2017).

Glucose measurement was taken on day one, day 60, and day 120 of the study (Pahra et al., 2017). The Friedman's, post hoc Wilcoxon's, and Mann-Whitney *U*-tests were used to analyze the results of the study. Results of the study demonstrated that participants in the post-meal exercise intervention group had a significant decrease in HbA1c values in comparison to those in the once-a-day exercise group (Pahra et al., 2017). Limitations of the study were 1) failure to include carbohydrate count, and 2) failure to use continuous glucose monitoring systems (Pahra et al., 2017).

Therapeutic Healing and Diabetes. In addition to pharmacological treatment, research studies have identified other complementary and alternative treatments for the management of diabetes (Kumar et al., 2016). Kumar et al. (2016) performed a meta-analysis review to evaluate the effect of yoga therapy in the management of HbA1c levels in individuals with type 2 diabetes. Inclusion criteria in the review were randomized controlled trials, controlled trials, and yoga interventions. Exclusion criteria in the review were studies that included other forms of

exercise for the control group, studies that focused solely on relaxation or meditation, and studies with multimodal interventions. The outcomes of the review were fasting blood sugar, post prandial blood sugar, and HbA1c levels. A total of 17 randomized controlled trials were selected for the final review (Kumar et al., 2016).

The risk of bias (ROB) screening was conducted by three researchers using the Cochrane ROB tool (Kumar et al., 2016). A statistical analysis was performed using the Review Manager software. Results of the meta-analysis demonstrated that yoga therapy was more effective in controlling overall blood sugar levels than other methods of standard care focused on pharmacological intervention (Kumar et al., 2016). Limitations of this meta-analysis were 1) language restrictions—exclusion of all languages except English—for the literature review search, and 2) study duration of less than 6 months, small sample size, publication bias, and poor methodology of studies used in literature review (Kumar et al., 2016).

Treatment Approaches to Diabetes Mellitus

Mortality Risks in Diabetes Treatment. Research studies have demonstrated the effect of diabetes management on mortality rates in adults with type 2 diabetes (Akirov et al., 2016). Akirov et al. (2016) conducted a cohort study in Israel to evaluate morality rates in individuals with treated versus untreated diabetes who were admitted to hospital medical units. A total of 35,340 individuals participated in the study. Of that number, 24,159 participants did not have diabetes, and 11,181 had diabetes. Akirov et al. (2016) collected self-reported data such as alcohol use, smoking habits, body mass index, and co-morbidities listed in their health records.

The study was conducted in a 1,300-bed tertiary medical center in Israel, with participants' mortality data collected between the year of 2011 to 2015 (Akirov et al., 2016). Patients in the cohort were categorized into five groups: "(1) no DM, (2) non-medically treated;

(3) DM treated with one non-insulin drug; (4) DM treated with more than one non-insulin drug; and (5) insulin-treated DM, with or without oral agents" (Akirov et al., 2016, p. 1026). Variables collected were bedside blood glucose values and HbA1c levels. The outcome of the study was focused on the mortality rate. The Dunnett's procedure, Kaplan-Meier curve, and the Cox tests were used to analyze the results of the study. Results of the study indicated that individuals with untreated diabetes were more likely to die than individuals without diabetes, or those with medically managed diabetes (Akirov et al., 2016). Limitations of the study were 1) incomplete intake data regarding length of diabetes disease and HbA1c concentration, and 2) medication adjustments, which could have potentially led to changes in the outcomes (Akirov et al., 2016).

In England, a cohort study was conducted to establish the relationship between ethnicity and life expectancy in individuals living with diabetes (Wright et al., 2017). Unlike other research studies, Wright et al. (2017) wanted to further evaluate cause-specific mortality rates in type 2 diabetes. The patients in this study were recruited from 383 general practices using the Clinical Practice Research Datalink (CPRD). The CPRD allowed the researchers to gather anonymous medical records from eligible practices. The Office of National Statistics and the Hospital Episode Statistics provided the mortality data necessary to complete the study.

A total of 187,968 patients' records of type 2 diabetes and 908,016 control patients without diabetes were included in the study (Wright et al., 2017). The patient population consisted of 1) adult males and females, and 2) White, South Asian, Black, Other, and Unknown ethnicity groups. The Chiang II method was used to estimate life expectancy among individuals in the intervention group (with diabetes) and the control group (without diabetes) over the years of 1998 to 2015. Other variables such as HbA1c, BMI, diabetes therapy, and comorbidities (smoking status, cardiovascular disease, renal disease, cancer, infections, etc.) were categorized

as well according to ethnicity. Results of the study concluded that South Asians diagnosed with diabetes had a longer life expectancy in comparison to Whites due to lower risk of cardiovascular and respiratory diseases (Wright et al., 2017). Limitations of the study were 1) data from small ethnic groups that were unable to be analyzed separately, 2) possibility of incorrect coding for certain ethnic groups, 3) ethnicity data missing for deaths that may have occurred earlier in the study, 4) inability to match ethnicity, which may have led to influenced outcomes for certain ethnic groups, and 5) need for confirmation of findings in populations independent of England (Wright et al., 2017).

Telehealth and Diabetes Education

Nurse-led Rural Telehealth Diabetes Intervention. Research studies have demonstrated the positive effects of telehealth-based communication in diabetes management (Barker et al., 2016). Barker et al. (2016) conducted a cohort study in West Virginia to evaluate the effectiveness a nurse-led telehealth diabetes intervention for individuals living in the Appalachia rural area. There was a total of 10 individuals recruited for the study, with a final count of eight individuals at the end of the study. Inclusion criteria for the study were 1) adults 18 years and older, 2) type 2 diabetes diagnosis with a HbA1c greater than or equal to 7.5%, and 3) telephone access. The Behavior Score Dashboard (BSD) instrument – developed by the American Association of Diabetes Educators (AADE) – was used to evaluate the health behaviors of participants in the study (Barker et al., 2016).

A nurse practitioner interventionist used ADA and AADE7 guidelines to provide interactive educational diabetes sessions for each participant over the telephone every week for 7 weeks (Barker et al., 2016). “The AADE7 self-care behaviors include healthy eating, being activity, monitoring, taking medication, problem-solving, reducing risks, and healthy coping”

(Barker et al., 2016, p. e226). Outcomes of the study were pretest and posttest BSD, weight, and blood glucose levels. Results of the study concluded telehealth-based diabetes interventions are an effective alternative to in-person interventions. There was a statistically significant increase in importance of activity level to participants ($p = 0.020$). There was also a statistically significant increase in measurement of patients' understanding of taking medications ($p = 0.011$). There was no statistically significant decrease in weight or glucose levels, although 75% of participants decreased their mean glucose levels (Barker et al., 2016). Limitations of the study were 1) small sample size, 2) short duration of study, and 3) limited feasibility of project due to amount of staff needed for completion of study and lack of reimbursement of funds spent (Barker et al., 2016).

Remote Monitoring and Glycemic Control. Lee et al. (2018) conducted a systemic review and meta-analysis of systematic reviews of randomized controlled trials to evaluate the impact of telehealth remote patient monitoring on glycemic control in individuals with type 2 diabetes. Multiple databases were searched by two independent reviewers with a date range of 1990 to April 2016. Inclusion criteria of the study were 1) systematic reviews and/or meta-analyses of randomized controlled trials with telehealth interventions, 2) adults 18 years and older with type 2 diabetes, 3) evaluation of standard outpatient diabetes education, and 4) HbA1c outcome. Exclusion criteria were 1) non-English studies, 2) participant populations not solely dedicated to individuals with type 2 diabetes, and 3) absence of study feedback to patients after submission of self-monitoring blood glucose information (Lee et al., 2018).

The AMSTAR tool was used to assess the risk of bias for each study (Lee et al., 2018). A total of 3,279 studies were identified in the literature search, with a total four studies qualified for inclusion in the final review. Results of the meta-analysis concluded that telehealth-based interventions were more effective on glycemic control in individuals with type 2 diabetes than

standard care (outpatient office visits). Telephone-based interventions demonstrated the greatest improvement on glycemic control, followed by internet-based blood glucose monitoring systems (Lee et al., 2018). Limitations of the study were 1) failure to review full-texts of each study included (allowing for errors in reporting), and 2) difference in format of telehealth interventions within each review of study, duration of study, sample size, medication use, and baseline HbA1c levels (Lee et al., 2018). Please see Appendix A for a level of evidence's table.

Synthesis of Literature Review

Based on the literature review, it is evident that balanced nutrition, physical activity, and weight maintenance have a major effect on glycemic control in adults with type 2 diabetes. Other factors that have an effect on self-management of type 2 diabetes are psychosocial factors such as mood control (anxiety and depression). The studies described above demonstrated that taking control of one's well-being typically leads to positive effects in mood, thus improving self-care habits and diabetes management. References from international studies were reviewed for this study to reflect the clinic population. Northern Virginia Internal Medicine and Pediatrics clinic serves individuals within multiple ethnic and cultural communities in the area. The research articles focused on the positive effects of physical activity and healthy nutrition in diabetes educational programs.

This review of relevant literature establishes that the goal of this project was appropriate for the proposed group of test subjects. The long-term goal of this research project is to improve the attitudes and knowledge of type 2 diabetics by encouraging interactive diabetes education and peer support groups using telehealth. The means of telehealth communication for health education is needed more now than ever during these times of COVID-19. This will allow

individuals with type 2 diabetes to join together and learn new ways to manage their disease while supporting each other from the safety of their homes.

CHAPTER III

METHODOLOGY

Study Design

The study design for this project was a pretest posttest design and subjects were asked to take a pretest and a posttest survey. This study design was selected to assess if a diabetes educational session using telehealth-based measures will improve the attitudes and knowledge of adult individuals with type 2 diabetes. The telehealth-based intervention for this project was chosen due to the introduction of the COVID-19 virus into the United States. This method allowed participants to partake in the study from the comfort of their home, therefore reducing the possibility of contracting COVID-19 in an in-person, enclosed setting.

Project Sample and Setting

A power analysis was performed to allow the DNP student researcher to obtain the convenience sample size needed to obtain the desired effect in the study (Dziadkowiec, 2021). A power analysis determined that the anticipated number of subjects of 35 patients would be needed to reject the null hypothesis. An analysis of .80 power determined that the DNP student researcher can correctly reject the null hypothesis; there will be no change in attitudes and knowledge of individuals with type 2 diabetes using telehealth-based, interactive educational groups.

Participants in this study were recruited from the Northern Virginia Internal Medicine and Pediatrics clinic in Arlington, VA. The inclusion criteria for this research project were 1) English-speaking, 2) adults ages 18 years and older, 3) individuals with a clinical diagnosis of type 2 diabetes, 4) individuals who visit the healthcare providers at Northern Virginia Internal Medicine and Pediatrics, and 5) access to internet services to participate in educational telehealth

services. Individuals who did not meet the inclusion criteria were excluded from the study. The group subject to the intervention is the experimental group. The setting of this study took place in an uncontrolled location. Participants were allowed to take the online Qualtrics survey and attend the online educational class via their phone, tablet, or laptop/computer.

***Human Subjects Protection*.** Participation in this study was completely voluntary and not forced. The risk to participating in this study was minimal or no more than would be encountered in everyday life. The benefits of the study were free diabetes education and possible prevention of long-term diabetes complications.

Instruments

The DSMQ is an instrument tool that was developed by Schmitt et al. (2013) to evaluate self-care behaviors in correlation with glycemic control in individuals with type 1 and type 2 diabetes (Appendix B). This final questionnaire started with 37 items and was narrowed down to 16-items that focused on medication intake, diabetes-related diet, self-monitoring of blood glucose, physical activity, compliance with doctor's appointments, self-care activities, record of glucose levels, and generalized feelings of self-care management. Rating scales were measured on a 4-point Likert scale in reverse negativity wording to prevent neutral responses and provide honest responses. The scale ratings are as follows: applies to me very much = three points; applies to me a considerable degree = two points; applies to me some degree = one point; and does not apply to me = zero points. When completing data analysis, a higher total sum scale of points represents a better score for each category (Schmitt et al., 2013).

A statistical analysis for the survey was conducted using the Systat Software and Statistical Package for the Social Sciences (SPSS) 21.0.0 program (Schmitt et al., 2013). A One-way Analysis of Variance, Student's *t*-test, and Pearson's chi-squared test were used to perform

the data analysis with a *p*-value of <0.05 for measure of statistical significance. Results of the original study proved to be internally consistent with a Cronbach's alpha (α) of sum scale = 0.84, α = 0.77 for blood glucose management, α = 0.77 for dietary management, α = 0.76 for physical activity, and α = 0.60 for healthcare use (Schmitt et al., 2013). Other studies to be used to evaluate self-care behaviors in correlation with glycemic control in individuals with type 1 and type 2 diabetes. Another study by Bukhsh et al. (2017) was conducted to evaluate the DSMQ against diabetes self-care activities which resulted in high internal consistency. The results of the study demonstrated α = 0.96 for sum scale, α = 0.91 for blood glucose management, α = 0.88 for dietary management, α = 0.89 for physical activity, and α = 0.73 for healthcare use proving that the DSMQ is a reliable and valid instrument. The DSMQ tool was downloaded for free by creating an account and answering a series of licensing questions on the MAPI Research Trust website.

Procedure

The recruitment process took place over the course of 3 months. Two processes were done to recruit eligible participants for this study. The first process to obtain participants from the clinic were to post a recruitment flyer (Appendix C) on the wall at the front desk, and a flyer in all five patient examination rooms. This was done by the DNP student researcher. The second process to obtain participants were to send an initial email message (Appendix D) using blind carbon copy (BCC) communication to all adult patients with type 2 diabetes from the clinic's electronic health records system. This was done by the clinic physician on three separate occasions. The flyer and initial email message described the purpose of the research study, eligibility requirements, number and age requirements of participants needed, contact information for the DNP student researcher, and the name of the school institution. Participants

who were interested in the study were asked to contact the DNP student researcher by the email address provided in the recruitment email and/or flyer. All emails sent from the DNP student researcher to participants were sent using BCC communication. Once a potential participant contacted the DNP student researcher, an initial responding email (Appendix E) using BCC communication was sent to the participants with a link provided to access the online Qualtrics survey along with the date information for the Zoom educational session. The subjects were allowed the opportunity to complete the initial DSMQ pretest questionnaire via Qualtrics. Participants were given the option to complete the initial DSMQ survey up until the survey closed on the day of the Zoom educational session. With each corresponding email that was sent by the DNP student researcher, subjects were allowed the opportunity to ask questions before participating in the research study. The DNP student researcher sent the first follow-up email (Appendix F) after one week to all interested participants as a reminder to complete the Qualtrics survey and information about the Zoom educational session. The DNP student researcher sent a second follow up email (Appendix G) after the second week to all interested participants as a reminder to complete the Qualtrics survey and information about the Zoom educational session. The DNP student researcher sent a final email (Appendix H) one day prior to the Zoom educational session as a reminder of the event and notification for participants to complete the Qualtrics survey.

Intervention. Prior to the telehealth (Zoom) group meeting, study participants were asked to complete a 10-minute DSMQ through Qualtrics as a baseline measurement prior to the beginning of the diabetes educational session. A consent form (Appendix I) was posted on the first page of the Qualtrics survey. The DNP student researcher obtained informed consent by using the Cover Letter for Internet Research on a Radford University letterhead within the

Qualtrics survey provided to the participants by internet link. After reading the online informed consent cover letter, the subjects provided consent by selecting "I consent, begin the study" and clicking the arrow to begin the questionnaire at the bottom of the page (Appendix I). The consent from was followed by demographic questions and participant identification questions (Appendix J). The four patient identifier questions were used to identify a patient while maintaining privacy and confidentiality. There were no additional surveys administered apart from the DSMQ questionnaire and the patient identifier/demographic questions.

After completion of the initial survey, the participants received a 40-minute, telehealth-based diabetes educational session using Zoom and PowerPoint slides (Appendix K) in a group session. Another 30 minutes were allotted at the end of the session for questions, answers, and group discussion using interaction-guided questions. This allowed the participants time to bond and promote peer support on the challenges and successes of managing type 2 diabetes. Two identical educational sessions were held on two separate dates to allow flexibility for participants to attend the Zoom meeting. The participants were asked to attend only one group session. The diabetes educational session focused on the general description of diabetes, signs and symptoms, nutrition, exercise, management, and diabetes care schedules. Immediately after each online diabetes educational session, a second Qualtrics survey link was emailed to participants to complete a follow up 10-minute DSMQ survey to assess any changes in participants' attitudes and knowledge about diabetes. This concluded subject participation for the study. For privacy of the participants, the educational Zoom session was not audio or video recorded.

Data Collection and Storage. Personnel that were necessary to implement the project include front desk personnel, the clinic providers, and the DNP student researcher. A password protected Qualtrics account was used to collect pretest and posttest survey data and the data will

be stored in Qualtrics for 3 years after the completion of the study. The DNP project team leader, Dr. Carey Cole, and the DNP student researcher will have access to the Qualtrics data after the completion of the study. A password-secured laptop was provided by the DNP student researcher of the study for storage of data.

The DNP student researcher's email address was used to send the Qualtrics survey link to each participant in the study. The names of the subject were not linked to specific information. Four participant identification questions (Appendix J) were asked in the Qualtrics survey to allow for anonymity. Those questions generated a four-digit code using three numbers and one letter which was used to link the participants to their responses without revealing their identity.

Data information was stored in a password encrypted Word file on a laptop provided by the DNP student researcher of this study. The DNP student researcher is the only person who has access to the laptop. The individuals who have access to the data electronic files are the DNP student researcher and the DNP project committee team leader. The electronic data files will be kept by the DNP project team leader, then destroyed by erasing the electronic files 3 years after the completion of the study.

Statistical Analysis

The major objective for this project was to evaluate the effect of diabetes self-management education on DSMQ scores to assess any changes in participants' attitudes and knowledge about diabetes. The outcome variable is diabetes self-management. A paired *t*-test was used to measure the effect of interactive diabetes group education on DSMQ score before and after the study, using the SPSS 28.0 software program. The primary outcome variables for this project were DSMQ scores before and after the Zoom educational session.

***Sustainability*.** The ability to sustain a program is essential in managing the care of individuals with type 2 diabetes. Although Northern Virginia Internal Medicine and Pediatrics does not currently incorporate diabetes educational groups, it would be beneficial to incorporate it into primary care considering that research studies have discussed the benefits of group visits and social peer interactions in the management of type 2 diabetes. An ethical consideration in this study was the removal of in-person, psychological/peer support for individuals in the intervention group (i.e., studies have demonstrated that peer support in-person group settings lead to increased self-care in diabetes management [Peimani et al., 2018]).

CHAPTER IV

RESULTS

The overall purpose of this chapter is to review the findings of this research study. The research question is as follows: "What is the effect of a telehealth-based, interactive diabetes educational group session on the attitudes and knowledge of individuals with type 2 diabetes?" The null hypothesis states: "There will be no effect on the attitudes and knowledge of type 2 diabetics using telehealth-based, interactive diabetes educational groups." A description of the sample followed by an analysis of research question was conducted. All statistical analyses for this study were conducted using Statistical Package for the Social Sciences (SPSS) 28.0.

Description of Sample

As outlined in Chapter III, a goal of 35 adult participants from Northern Virginia Internal Medicine and Pediatrics clinic were needed for the study. The recruitment plan was originally designed to occur over the course of 3 weeks, but due to a lack of initial participants, the recruitment process was extended from December 2021 to February 2022. A diabetes recruitment flyer was posted at the front desk and in all five examination rooms of the clinic (Appendix C). The clinic physician sent out an initial BCC email message three times over the duration of the recruitment process, which led to the enrollment of 25 participants for the research study (Appendix D). Two telehealth-based educational sessions were held on separate days. One participant attended the first session, and nine participants attended the second session, resulting in a total of 10 participants for both educational sessions.

A total of 25 participants requested to participate in the study. One participant requested to be removed from the study due to lack of time for participation. The pretest survey received a total of 21 complete responses, three of which were repeat surveys answered by two participants.

These surveys (*n* = 3) were excluded from the final sample. The posttest survey received a total of 11 complete responses and two incomplete responses. The incomplete responses (*n* = 2) were excluded from the final sample. After matching the four-patient identifiers from the pretest and posttest surveys, a total of seven responses were matched and selected for the final sample data analysis. There was a total of 61% of participants (*n* = 11) who completed the pretest survey and did not complete the posttest survey. In contrast, 27% of participants (*n* = 3) who completed the posttest survey and did not complete the pretest survey, and one did not thoroughly complete the participant demographic questions, leaving the final sample size of *n* = 7.

The participant demographic age groups for the final sample were 18-24 years old, 25-34 years old, 35-44 years old, 45-54 years old, 55-54 years old, and 65+ years old (Table 1). A majority of the participants (*n* = 4) were between the age groups of 45-54 years old and 55-64 years old. Of the matched pretest and posttest surveys, 42.9% of respondents were male (*n* = 3), and 57.1% of respondents were female (*n* = 4) (Table 2).

Table 1

Participant Age Groups

Age	N	%
18-24	1	14.3%
25-34	1	14.3%
35-44	0	0.0%
45-54	2	28.6%
55-64	2	28.6%
65+	1	14.3%

Table 2

Participant Gender Characteristics

Gender	N	%
Male	3	42.9%
Female	4	57.1%
Total	7	100%

Analysis of Research Question

The purpose of this study was to evaluate if a telehealth-based educational diabetes program will show an improvement in DSMQ scores.

Research Question: What is the effect of a telehealth-based, interactive diabetes educational group session on the attitudes and knowledge of individuals with type 2 diabetes?

Sum Scale. A paired *t*-test was conducted to determine if there was any difference in score comparison between the primary study variable of the sum scale pretest and posttest scores (Polit, 2010). Results of the study concluded there was an improvement in DSMQ scores (M = 7.74 vs. 8.06, SD = 1.60 vs. 1.42, 95% CI [-1.53, 0.88]) (Table 3). According to Polit (2010), this is not statistically significant, $p > 0.05$ ($p = 0.53$) (Table 4). Due to the lack of statistical significance, this study would fail to reject the null hypothesis which states: "There will be no effect on the attitudes and knowledge of type 2 diabetics using telehealth-based, interactive diabetes educational groups."

Table 3

DSMQ Sum Scale Scores

		Mean	N	Std. Deviation	Std. Error Mean
Sum Scale Scores	Pretest Score	7.7400	7	1.60433	.60638
	Posttest Score	8.0657	7	1.42191	.53743

Table 4

DSMQ Sum Scale Scores Paired T-test

Paired Samples Test										
		Paired Differences							Significance	
					95% Confidence Interval of the Difference					
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	One-Sided p	Two-Sided p
Sum Scale Scores	Pretest Score - Posttest Score	-.32571	1.30586	.49357	-1.53343	.88200	-.660	6	.267	.534

Dietary Control. Table 5 is a comparison review of the subscale dietary control scores. The paired *t*-test revealed there was no statistical significance, $p > 0.05$ ($p = 0.66$). Findings demonstrated an improvement in overall dietary control scores though not significant ($M = 6.96$ vs. 7.26, $SD = 2.26$ vs. 1.64, 95% CI [-1.91, 1.31]) (Table 5 and 6).

Table 5

Dietary Control Subscale Paired T-test

Paired Samples Test										
		Paired Differences							Significance	
					95% Confidence Interval of the Difference					
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	One-Sided p	Two-Sided p
Dietary Control Scores	Dietary Control Pre-Score Dietary Control Post-Score	-.29714	1.74722	.66039	-1.91306	1.31877	-.450	6	.334	.669

Table 6

Dietary Control Subscale Scores

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Dietary Control Scores	Dietary Control Pre-Score	6.9629	7	2.26696	.85683
	Dietary Control Post-Score	7.2600	7	1.64723	.62259

Glucose Management. The glucose management subscale was interpreted using a paired *t*-test. There was no statistical significance between pretest and posttest glucose management scores, $p > 0.05$ ($p = 0.52$) (Table 7). Although the results were not statistically significant, the findings demonstrated an improvement in glucose management scores ($M = 7.90$ vs. 8.38, $SD = 1.59$ vs. 1.79, 95 % CI [-2.18, 1.23]) (Table 7 and 8).

Table 7

Glucose Management Subscale Paired T-test

Paired Samples Test										
		Paired Differences							Significance	
					95% Confidence Interval of the Difference					
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	One-Sided p	Two-Sided p
Glucose Scores	Glucose Management Pre-Score Glucose Management Post-Score	-.47429	1.84476	.69725	-2.18040	1.23183	-.680	6	.261	.522

Table 8

Glucose Management Subscale Scores

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Glucose Scores	Glucose Management Pre-Score	7.9057	7	1.59745	.60378
	Glucose Management Post-Score	8.3800	7	1.79930	.68007

Physical Activity. A paired *t*-test was performed to determine if there was any significance between pretest and posttest physical activity scores. There was no statistical significance found, $p > 0.05$ ($p = 0.60$) (Table 9). Despite the lack of statistical significance, there was an overall improvement in scores ($M = 7.30$ vs. 7.93, $SD = 3.08$ vs. 1.97, 95% CI [-3.45, 2.18]) (Table 9 and 10).

Table 9

Physical Activity Subscale Paired T-test

Paired Samples Test										
		Paired Differences							Significance	
					95% Confidence Interval of the Difference					
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	One-Sided p	Two-Sided p
Physical Activity Scores	Physical Activity Pre-Score Physical Activity Post-Score	-.63571	3.05251	1.15374	-3.45882	2.18739	-.551	6	.301	.602

Table 10

Physical Activity Subscale Scores

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Physical Activity Scores	Physical Activity Pre-Score	7.3014	7	3.08429	1.16575
	Physical Activity Post-Score	7.9371	7	1.97078	.74488

Physician Contact. Table 11 is a paired *t*-test demonstration of the physician contact subscale scores. There was no statistical significance noted, $p > 0.05$ ($p = 0.68$). Physician contact was the only subscale category that showed a decrease in overall scores ($M = 8.57$ vs. 8.41, $SD = 2.00$ vs. 2.38, 95% CI [-0.76, 1.08]) (Table 11 and 12).

Table 11

Physician Contact Subscale Paired T-test

Paired Samples Test

		Paired Differences							Significance	
					95% Confidence Interval of the Difference					
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	One-Sided p	Two-Sided p
Total Scores	Physician Contact Pre-Score Physician Contact Post-Score	.15857	.99871	.37748	-.76508	1.08222	.420	6	.345	.689

Table 12

Physician Contact Subscale Scores

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Total Scores	Physician Contact Pre-Score	8.5714	7	2.00085	.75625
	Physician Contact Post-Score	8.4129	7	2.38915	.90302

Test for Reliability. To determine if the DSMQ instrument scale was reliable for this research study, a Cronbach's alpha statistical analysis was conducted. Results of the analysis demonstrated an acceptable sum scale score for the DSMQ for this study, $\alpha = 0.77$ (Polit, 2010). The dietary control subscale was also shown to be reliable, $\alpha = 0.75$. The glucose management and physical activity subscales were not acceptable forms of reliability $\alpha = 0.58$, $\alpha = 0.46$, respectively. Lastly, the physician contact subscale was shown to be reliable, $\alpha = 0.94$.

Table 13

Subscale Reliability Statistics

	Cronbach's Alpha
Sum Scale	.772
Dietary Control	.759
Glucose Management	.584
Physical Activity	.467
Physician Contact	.946

Summary of Results

In summary, the research question of the study was answered using a paired *t*-test study, descriptive and frequency statistics, and a Cronbach's alpha statistical analysis. The null hypothesis failed to be rejected, likely due to limited sample size ($n = 7$). However, results of this study showed an improvement in DSMQ sum scale scores ($M = 7.74$ vs. 8.06, $SD = 1.60$ vs. 1.42), dietary control subscale scores ($M = 6.96$ vs. 7.26, $SD = 2.26$ vs. 1.64), glucose management subscale scores ($M = 7.90$ vs. 8.38, $SD = 1.59$ vs. 1.79), and physical activity subscale scores ($M = 7.30$ vs. 7.93, $SD = 3.08$ vs. 1.97). Findings also revealed a decrease in physician contact subscale scores ($M = 8.57$ vs. 8.41, $SD = 2.00$ vs. 2.38).

CHAPTER V

DISCUSSION

This chapter reviews the relationship of the findings of this study in comparison to the findings of prior research studies. This chapter will also examine the statistical analysis process in relationship to the theoretical framework used in this study, Prochaska and Diclemente's Transtheoretical Model of Change (TTM) of 1982. Lastly, this chapter will discuss the limitations of this study, implications for future research and healthcare practice, and conclusion of this diabetes research study.

Summary

The purpose of this pretest, posttest study was to evaluate if a telehealth-based, diabetes interventional program will influence the attitudes and knowledge of adults diagnosed with type 2 diabetes. This study used paired *t*-test, frequency and descriptive statistics, and Cronbach's alpha statistical analyses processes to analyze and compare the Diabetes Self-Management Questionnaire (DSMQ) responses prior to and after the telehealth-based diabetes educational course. The pretest and posttest data for this study was anonymously collected using the online survey database, Qualtrics.

The research question of this study asks, "What is the effect of a telehealth-based, interactive diabetes educational group session on the attitudes and knowledge of individuals with type 2 diabetes?" The findings of this research study concluded that there was an overall improvement in the attitudes and knowledge of adults with type 2 diabetes (n = 7) who underwent a telehealth-based, diabetes interventional program with majority of participants (57.14%) showing an improvement in DSMQ scores (M = 7.74 vs. 8.06, SD = 1.60 vs. 1.42). The findings of this research study were not statistically significant, thus resulting in a failure to

reject the null hypothesis, which states, “There will be no effect on the attitudes and knowledge of type 2 diabetics using telehealth-based, interactive diabetes educational groups.” This failure to reject the null hypothesis is likely related to the small sample size and lack of follow-up, and lack of completion of posttest questionnaires. With a larger sample, significant results may have been determined, warranting a replication of this study with a larger sample.

Other findings of this research study concluded that there was an improvement in the dietary control subscale scores (M = 6.96 vs. 7.26, SD = 2.26 vs. 1.64). There was also an improvement in glucose management subscale scores (M = 7.90 vs. 8.38, SD = 1.59 vs. 1.79), and physical activity subscale scores (M = 7.30 vs. 7.93, SD = 3.08 vs. 1.97). Improvement in the sum scale, dietary control, glucose management, and physical activity subscale scores demonstrate participant progression through the stages of the TTM on a smaller scale due to limited duration of this research study in comparison to the 6 months of changes within the TTM.

Muñoz-López et al. (2021) conducted a cross-sectional study in Mexico to evaluate patients’ level of adherence to type 2 diabetes management using the TTM. Individuals who were more likely to have unhealthy diet choices, sedentary lifestyle, and limited knowledge on medication adherence demonstrated an improvement in behavioral changes that led to a healthier lifestyle through the TTM. Results of the study concluded that the TTM instrument used was found to be justifiable and reliable with a Cronbach’s $\alpha = 0.92$, with a significance level of $p > 0.05$ (Muñoz-López et al., 2021; Polit, 2010). These findings further support the acceptance of the use of the TTM in management of type 2 diabetes.

An unexpected finding in this research study was the mild decrease in physician contact subscale scores (M = 8.57 vs. 8.41, SD = 2.00 vs. 2.38). This finding may have occurred due to

respondent error in the online Qualtrics survey responses. Another reason why this may have occurred is due to an intentional decrease in physician follow-up appointments due to the COVID-19 pandemic, although it is highly unlikely due to the limited duration of this study.

The hallmark study that used the DSMQ instrument scale is Schmitt et al. (2013). The DSMQ is reliable with a Cronbach's α of sum scale = 0.84. The Cronbach's α of sum scale (or total DSMQ score) for this study was α = 0.77, indicating it to be a reliable measurement scale for this sample (Table 13) (Polit, 2010). Although the Cronbach's α for this study is lower than the sum scale Cronbach's α of the original study (α = 0.84), the use of the DMSQ for this study is still an acceptable measure of reliability. As stated in Chapter III, Schmitt et al. (2013) reported a Cronbach's α = 0.77 for glucose management, α = 0.77 for dietary control, α = 0.76 for physical activity, and α = 0.60 for healthcare use. In contrast, this research study reported lower scores of Cronbach's α = 0.75 for dietary control, α = 0.58 for glucose management, and α = 0.46 for physical activity. An unexpected finding was a Cronbach's α = 0.94 for physician contact (healthcare use), which is an exceptionally high reliability in comparison to the original study. The difference in Cronbach's α scores could potentially be a result of the notable variance in sample sizes between this study and the original study.

Another research study with a similar sample size (n = 8) that supports this current study is Barker et al. (2016). Barker et al. (2016) conducted a nurse-led, telehealth-based diabetes in West Virginia which determined that telehealth-based diabetes interventions are an effective alternative to in-person interventions. There was a statistically significant increase in the patients' physical activity level and understanding of pharmacological management (Barker et al., 2016). The statistically significant difference in the previous research study in comparison to the current study could be a result of the use of different telehealth platforms. Barker et al.

(2016) used a telephone for education and communication with patients, whereas this research study used the Zoom platform for education and email for communication with patients.

Limitations

One limitation of this study is the small sample size. This study needed a total of 35 participants, but after an extensive 3-month recruitment process at Northern Virginia Internal Medicine and Pediatrics, a total of 25 participants were recruited, with only seven subjects thoroughly completing both pretest and posttest surveys. Also, the participants in this study were recruited from only one clinic location in the Northern Virginia area, which is not representative of the entire diabetes adult population. A second limitation of this study was the short duration. The majority of the participants in this study took their pretest survey within the 2-week span of the posttest survey.

A third limitation of this study may be biased responses for pretest questionnaires due to social desirability as this may have influenced the true outcomes of the study. A fourth limitation of the study is the limited number of individuals who attended the telehealth educational sessions (n = 10) in comparison to the number of participants who originally requested to participate in the study (n = 25). A fifth limitation of this study is the DSMQ scale is not considered to be fifth grade reading level and the absence of other low-literacy DSMQ survey options available. Lastly, another challenge of the study is steady access to internet services for participation in the study. Utilizing a different telehealth method for this study such as telephone may have encouraged more patients to participate in the study in comparison to using the Zoom platform.

Future Research and Healthcare Practice

This study identified the importance of using alternative methods of education to promote diabetes self-management. Traditional methods of diabetes education typically occur during

primary care office visits or within in-person group class settings. This research study allowed participants to have the flexibility of attending a Zoom diabetes educational session, which can potentially improve diabetes compliance long-term. With the increasing number of individuals working from home due to the COVID-19 pandemic, this method of education allows individuals to attend these sessions without the inconvenience of having to leave home in the middle of the workday to attend healthcare appointments.

To further improve this study, there are several recommendations that could be incorporated for future implementation. One recommendation for future research on this study topic would be to obtain participants from more than one location to allow for generalization of the outcomes. This study focused on one practice in the Northern Virginia area, but future studies could expand the location of recruit to different regions of the country, and potentially the type of location as well (e.g., hospital, social media, etc.). A second recommendation for this study would be to increase the sample size. This will prevent outlier data from skewing the results of the study, thus reporting more accurate mean values within the study. As evidenced by the lower DSMQ Cronbach's α scores in comparison to Schmitt et al. (2013) DSMQ Cronbach's α scores, a smaller sample size could also influence the internal reliability of the instrument scale used for the study.

The use of financial incentives in a replicated research study may also have a positive influence on the turnout of participant recruitment and participation maintenance throughout the study. Other importance recommendations for future research to include are 1) more specific patient demographic information (e.g., race, ethnicity, education level, income status, length of years with diabetes condition) as these are variables that could hypothetically influence the outcome of an individual's diabetes self-management.

An interesting fact to note was participant responses to the question, “Tell me what challenges you have experienced with type 2 diabetes,” within the Qualtrics survey (Appendix J). A few of the responses primarily focused on common challenges such as dietary management and exercise, while other responses revealed more alarming issues such as occasional blurry vision and peripheral neuropathy in the arms. Why is this important? Visual changes related to diabetes are a result of long-term, uncontrolled elevated blood sugars that can potentially lead to blindness (Mayo Clinic, 2021). Peripheral neuropathy in the limbs, more specifically the lower extremities, can lead to decreased sensation in an area (such as the foot) that is prone to unhealed cuts and bruises. Overtime, this could lead to serious infections that may result in limb amputation (Mayo Clinic, 2021). It is essential for healthcare providers to continue to provide regular diabetes education to prevent and control diabetes complications.

Conclusion

This research study evaluated the effect of a telehealth-based, interactive diabetes education on diabetes self-management scores in adults diagnosed with type 2 diabetes in Northern Virginia to better aid the adult population. The findings of this research study demonstrated an improvement in diabetes self-management scores and could be applied to evidence-based practice to further improve current diabetes interventions. Although the promotion of diabetes self-management practices can be a time-consuming task in general office visits, it is essential for healthcare providers to continue to incorporate diabetes education. As this research study demonstrates, diabetes education could be performed during office visits/telehealth sessions, through monthly diabetes educational sessions independent from the patient-provider regular clinical visit, or through weekly/monthly patient portal reminders (via email or text message).

The increasing prevalence of diabetes in the United States could lead to negative outcomes and the increase of other healthcare illnesses. Research studies have demonstrated the importance of self-management skills including weight management, healthy eating, and physical activity in the reduction of HbA1c values. Also, peer support plays a role in improving the self-care in diabetes management. Together with researchers, healthcare providers can help reduce the prevalence of type 2 diabetes, improve management of diabetes, and reduce associated healthcare costs.

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Appendix A

Literature Review Level of Evidence

Author & Year	**Level/** **Quality of Evidence**	**Study Design**
ADA (DPP) (2002)	Level II	Randomized Control Trial
Adam et al. (2018)	Level II	Randomized Control Trial
Akirov et al. (2016)	Level III	Cohort
Barker et al. (2016)	Level III	Cohort
Chai et al. (2018)	Level II	Randomized Control Trial
Fall et al. (2013)	Level II	Randomized Control Trial
Gamiochipi et al. (2016)	Level II	Randomized Control Trial
Jutterström et al. (2016)	Level II	Randomized Control Trial
Kumar et al. (2016)	Level I	Meta-Analysis
Lean et al. (2018)	Level II	Randomized Control Trial
Lee et al. (2018)	Level I	Meta-Analysis
Machry et al. (2018)	Level I	Meta-Analysis
Mohamed et al. (2013)	Level II	Randomized Control Trial
Muñoz-López et al. (2021)	Level IV	Cross-Sectional
Pahra et al. (2017)	Level II	Randomized Control Trial
Peimani et al. (2018)	Level II	Randomized Control Trial
Wright et al. (2017)	Level III	Cohort

Appendix B

Diabetes Self-Management Questionnaire (DSMQ)

The following statements describe self-care activities related to your diabetes. Thinking about your self-care over the **last 8 weeks**, please specify the extent to which each statement applies to you. Note: If you monitor your glucose using continuous interstitial glucose monitoring (CGM), please refer to this where 'blood sugar checking' is requested.	applies to me very much	applies to me to a consider-able degree	applies to me to some degree	does not apply to me
1. I check my blood sugar levels with care and attention. ☐ *Blood sugar measurement is not required as a part of my treatment.*	☐3	☐2	☐1	☐0
2. The food I choose to eat makes it easy to achieve optimal blood sugar levels.	☐3	☐2	☐1	☐0
3. I keep all doctors' appointments recommended for my diabetes treatment.	☐3	☐2	☐1	☐0
4. I take my diabetes medication (e. g. insulin, tablets) as prescribed. ☐ *Diabetes medication/insulin is not required as a part of my treatment.*	☐3	☐2	☐1	☐0
5. Occasionally I eat lots of sweets or other foods rich in carbohydrates.	☐3	☐2	☐1	☐0
6. I record my blood sugar levels regularly (or analyse the value chart with my blood glucose meter). ☐ *Blood sugar measurement is not required as a part of my treatment.*	☐3	☐2	☐1	☐0
7. I tend to avoid diabetes-related doctors' appointments.	☐3	☐2	☐1	☐0
8. I do regular physical activity to achieve optimal blood sugar levels.	☐3	☐2	☐1	☐0
9. I strictly follow the dietary recommendations given by my doctor or diabetes specialist.	☐3	☐2	☐1	☐0
10. I do not check my blood sugar levels frequently enough as would be required for achieving good blood glucose control. ☐ *Blood sugar measurement is not required as a part of my treatment.*	☐3	☐2	☐1	☐0
11. I avoid physical activity, although it would improve my diabetes.	☐3	☐2	☐1	☐0
12. I tend to forget to take or skip my diabetes medication (e. g. insulin, tablets). ☐ *Diabetes medication/insulin is not required as a part of my treatment.*	☐3	☐2	☐1	☐0
13. Sometimes I have real 'food binges' (not triggered by hypoglycaemia).	☐3	☐2	☐1	☐0

14. Regarding my diabetes care, I should see my medical practitioner(s) more often.	☐3	☐2	☐1	☐0
15. I tend to skip planned physical activity.	☐3	☐2	☐1	☐0
16. My diabetes self-care is poor.	☐3	☐2	☐1	☐0

DSMQ – United Kingdom/English - Original version
DSMQ_AU1.0_eng-GBori

Appendix C

Recruitment Flyer

DO YOU HAVE TYPE 2 DIABETES?

FREE ONLINE DIABETES RESEARCH STUDY

ARE YOU FRUSTRATED WITH HIGH BLOOD SUGARS? YOU ARE NOT ALONE!

LEARN ABOUT HOW TO REDUCE YOUR RISK FOR TYPE 2 DIABETES COMPLICATIONS FROM THE COMFORT OF YOUR HOME OR OFFICE BY LOGGING IN ONLINE FOR A FREE ZOOM DIABETES EDUCATIONAL CLASS

CLASS TOPICS WILL INCLUDE:

- SELF-MONITORING BLOOD GLUCOSE
- HEALTHY EATING
- PHYSICAL ACTIVITY
- SHORT AND LONG-TERM EFFECTS
- MEDICATIONS
- PEER SUPPORT GROUP DISCUSSION

THE PURPOSE OF THIS STUDY IS TO EVALUATE THE EFFECT OF A TELEHEALTH-BASED, INTERACTIVE DIABETES EDUCATIONAL GROUP ON ATTITUDES AND KNOWLEDGE IN ADULTS WITH TYPE 2 DIABETES. THERE WILL BE NO COMPENSATION FOR PARTICIPATING IN THIS STUDY.

EVENT DATE(S): FRIDAY, FEBRUARY 25, 2022 FROM 1PM-2:10PM,
AND SATURDAY, FEBRUARY 26, 2022 FROM 1PM-2:10PM
OFFERED ONLINE VIA ZOOM. PLEASE SELECT ONE CLASS TO ATTEND.

REGISTER NOW! CLASS SIZE IS LIMITED TO 35 PARTICIPANTS
PARTICIPANTS MUST BE 18+ OLDER TO REGISTER AND A PATIENT OF NORTHERN VIRGINIA INTERNAL MEDICINE AND PEDIATRICS

TO REGISTER PLEASE CONTACT:

MICHELLE ENYINNAYA, BSN, RN
RADFORD UNIVERSITY DNP STUDENT RESEARCHER
MENYINNAYA@RADFORD.EDU

Appendix D

Initial Recruitment Email from NOVAMedPeds

Email Subject Title: Invitation to Participate in Diabetes Research Study

Email Body: Northern Virginia Internal Medicine & Pediatrics is reaching out to you to talk about an exciting research opportunity! This is a free, online diabetes educational class that we are offering to all our patients with type 2 diabetes. This study project has been approved by the Institutional Review Board of Radford University. The study will be led by Michelle Enyinnaya, a graduate Doctor of Nursing Practice student at Radford University.

The purpose of this study is to evaluate the effect of a telehealth-based, interactive diabetes educational group on attitudes and knowledge in adults with type 2 diabetes.

What does this mean for you? If you agree to participate in this voluntary study, you will be asked to complete the Diabetes Self-Management Questionnaire (DSMQ) prior to the online diabetes educational class on Zoom. It is anticipated that the questionnaire will take less than 10 minutes to complete. The online Zoom class will be held on Friday, February 25, 2022, from 1pm-2:10pm and on Saturday, February 26, 2022, from 1pm-2:10pm. After the class session is completed, you will be asked to complete the Diabetes Self-Management Questionnaire (DSMQ) again. All questionnaire responses will be anonymous and only disseminated to a limited number of researchers for statistical research purposes.

Who can participate in this study?

- Men and women ages 18 years and older with a diagnosis of type 2 diabetes
- English-speaking
- Access to online telehealth services (Zoom)
- Patient of Northern Virginia Internal Medicine & Pediatrics

If you would like to participate in this study, please contact Michelle Enyinnaya by phone at (703) 565-7213 or by email at menyinnaya@radford.edu.

Thanks in advance for your participation!

--
Northern Virginia Internal Medicine & Pediatrics

Appendix E

Initial Responding Email to Interested Participants

Email Subject Title: Invitation to Participate in Diabetes Research Study

Email Body: Thank you for your interest in this study! As you know, the purpose of this study is to evaluate the effect of a telehealth-based, interactive diabetes educational group on attitudes and knowledge in adults with type 2 diabetes.

What do I need to do now? If you agree to participate in this study, you will be asked to complete the Diabetes Self-Management Questionnaire (DSMQ) prior to the online diabetes educational class on Zoom. It is anticipated that the questionnaire will take less than 10 minutes to complete. The online Zoom class will be held on Friday, February 25, 2022, from 1pm-2:10pm and on Saturday, February 26, 2022, from 1pm-2:10pm. After the class session is completed, you will be asked to complete the Diabetes Self-Management Questionnaire (DSMQ) again. All questionnaire responses will be anonymous and only disseminated to a limited number of individuals for statistical research purposes.

If you would like to participate in this study, please click on the link below!

https://qfreeaccountssjc1.az1.qualtrics.com/jfe/form/SV_09tkdIdyRj2e61M

Thanks in advance for your participation!

--
Michelle Enyinnaya, BSN, RN

Appendix F

First Follow- up Email to Interested Participants

Email Subject Title: Your Participation is Needed in the Diabetes Research Study

Email Body: We are **TWO** weeks away from the Zoom diabetes educational class! This email serves as a reminder to complete the Diabetes Self-Management Questionnaire (DSMQ). If you have already completed it, we appreciate your responses and contribution to research in healthcare!

As you know, the purpose of this study is to evaluate the effect of a telehealth-based, interactive diabetes educational group on attitudes and knowledge in adults with type 2 diabetes.

What do I need to do now? The online Zoom class will be held on Friday, February 25, 2022, from 1pm-2:10pm and on Saturday, February 26, 2022, from 1pm-2:10pm. After the class session is completed, you will be asked to complete the Diabetes Self-Management Questionnaire (DSMQ) again. All questionnaire responses will be anonymous and only disseminated to a limited number of individuals for statistical research purposes.

If you would like to participate in this study, please click on the link below!

https://qfreeaccountssjc1.az1.qualtrics.com/jfe/form/SV_09tkdIdyRj2e61M

Thanks in advance for your participation!

--
Michelle Enyinnaya, BSN, RN

Appendix G

Second Follow-up Email to Interested Participants

Email Subject Title: Your Participation is Needed in the Diabetes Research Study

Email Body: We are ***ONE*** week away from the Zoom diabetes educational class! This email serves as a reminder to complete the Diabetes Self-Management Questionnaire (DSMQ). If you have already completed it, we appreciate your responses and contribution to research in healthcare!

As you know, the purpose of this study is to evaluate the effect of a telehealth-based, interactive diabetes educational group on attitudes and knowledge in adults with type 2 diabetes.

What do I need to do now? The online Zoom class will be held on Friday, February 25, 2022, from 1pm-2:10pm and on Saturday, February 26, 2022, from 1pm-2:10pm. After the class session is completed, you will be asked to complete the Diabetes Self-Management Questionnaire (DSMQ) again. All questionnaire responses will be anonymous and only disseminated to a limited number of individuals for statistical research purposes.

If you would like to participate in this study, please click on the link below!

https://qfreeaccountssjc1.az1.qualtrics.com/jfe/form/SV_09tkdIdyRj2e61M

Thanks in advance for your participation!

--
Michelle Enyinnaya, BSN, RN

Appendix H

Final Email to Interested Participants

Email Subject Title: Your Participation is Needed in the Diabetes Research Study

Email Body: We are ***ONE*** day away from the Zoom diabetes educational class! This email serves a final reminder to complete the Diabetes Self-Management Questionnaire (DSMQ). If you have already completed it, we appreciate your responses and contribution to research in healthcare! Please note that the initial questionnaire will close tomorrow, Saturday October 23, 2021, at 12pm.

As you know, the purpose of this study is to evaluate the effect of a telehealth-based, interactive diabetes educational group on attitudes and knowledge in adults with type 2 diabetes.

What do I need to do now? The online Zoom class will be held on tomorrow, Friday, February 25, 2022, from 1pm-2:10pm. After the class session is completed, you will be asked to complete the Diabetes Self-Management Questionnaire (DSMQ) again. All questionnaire responses will be anonymous and only disseminated to a limited number of individuals for statistical research purposes.

If you would like to participate in this study, please click on the link below!

https://qfreeaccountssjc1.az1.qualtrics.com/jfe/form/SV_09tkdIdyRj2e61M

Thanks in advance for your participation!

--
Michelle Enyinnaya, BSN, RN

CONFIDENTIALITY NOTICE: The information contained in this email message may contain private and confidential information which is intended for the use of the individual(s) or organization to whom it was addressed. If you are not the intended recipient and have received this email message in error, please notify the return sender and immediately delete all copies of this email message.

Final Email to Interested Participants

Email Subject Title: Your Participation is Needed in the Diabetes Research Study

Email Body: We are ***ONE*** day away from the Zoom diabetes educational class! This email serves a final reminder to complete the Diabetes Self-Management Questionnaire (DSMQ). If you have already completed it, we appreciate your responses and contribution to research in healthcare! Please note that the initial questionnaire will close tomorrow, Wednesday October 27, 2021, at 12pm.

As you know, the purpose of this study is to evaluate the effect of a telehealth-based, interactive diabetes educational group on attitudes and knowledge in adults with type 2 diabetes.

What do I need to do now? The online Zoom class will be held on tomorrow, Saturday, February 26, 2022, from 1pm-2:10pm. After the class session is completed, you will be asked to complete the Diabetes Self-Management Questionnaire (DSMQ) again. All questionnaire responses will be anonymous and only disseminated to a limited number of individuals for statistical research purposes.

If you would like to participate in this study, please click on the link below!

https://qfreeaccountssjc1.az1.qualtrics.com/jfe/form/SV_09tkdIdyRj2e61M

Thanks in advance for your participation!

--
Michelle Enyinnaya, BSN, RN

Appendix I

Informed Consent Form

You are invited to participate in a research survey, entitled *"Promoting Self-Care Management in Type 2 Diabetes: Interactive DM Group Education."* The study is being conducted by Carey Cole, DNP, FNP-BC, Iris Mullins, PhD, RN, and Michelle Enyinnaya, BSN, RN of Radford University's Graduate School of Nursing.

The purpose of this study is to examine the effect of a telehealth-based, interactive diabetes educational group on attitudes and knowledge in adults with type 2 diabetes. Research has shown that proper diabetes maintenance has helped reduce long-term complications of type 2 diabetes. A total of 35 adult individuals with type 2 diabetes will be asked to participate in this study. You will be asked to complete a 10-minute Diabetes Self-Management Questionnaire prior to the beginning of the diabetes educational session. There will be 40 minutes of diabetes education using the online telehealth platform Zoom, followed by another 30 minutes of peer support group discussion. At the end of the peer support group discussion, you will be asked to complete a follow up Diabetes Self-Management Questionnaire to assess any changes in your attitudes and knowledge about diabetes.

There are no anticipated risks from participating in this research. Participating in this study is free and at no cost to you. Some of the questions we will ask you as part of this study may make you feel uncomfortable. If you choose, you may participate in the educational session and omit answering the survey questions. You may refuse to answer any of the questions, take a break or stop your participation in this study at any time.

The research team will work to protect your data to the extent permitted by technology. It is possible, although unlikely, that an unauthorized individual could gain access to your responses because you are responding online. This risk is similar to your everyday use of the internet. Identification numbers associated with email addresses will be kept during the data collection phase for tracking purposes only. IP addresses will not be recorded. A limited number of research team members will have access to the data during data collection. Identifying information will be stripped from the final dataset.

Your participation in this study is voluntary. If you wish to withdraw from the study or have any questions, contact the investigator listed above. If you choose not to participate or decide to withdraw, there will be no impact on your relationship with Northern Virginia Internal Medicine & Pediatrics or Radford University.

If you have questions now about this study, ask before you provide consent. If you have any questions later, you may talk with Michelle Enyinnaya at menyinnaya@radford.edu. If this study raised some issues that you would like to discuss with a professional, you may contact Dr. Carey Cole at ccdaly@radford.edu.

This study was approved by the Radford University Committee for the Review of Human Subjects Research. If you have questions or concerns about your rights as a research subject or have complaints about this study, you should contact Ben Caldwell, Institutional Official and Dean of the College of Graduate Studies and Research, bcaldwell13@radford.edu, (540) 831-5724.

If all of your questions have been answered and you would like to take part in this study, then please provide consent below by selecting "I consent, begin the study" and clicking the arrow below to begin the questionnaire.

Appendix J

Qualtrics Demographic and Patient Identification Questions

Please note that all survey responses are anonymous and will be kept confidential.

Participant Information

Please indicate your sex/gender.

- Male
- Female

Please select your age group.

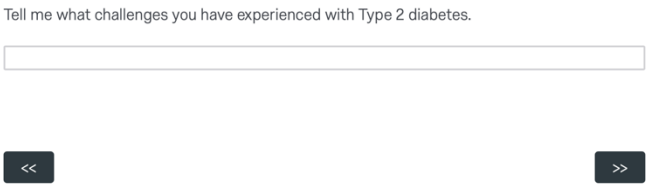
- 18-24
- 25-34
- 35-44
- 45-54
- 55-64
- 65+

Please enter the last number of your primary phone number.

Please enter the last number of your social security number.

Please enter the first number of your street address.

Please enter the first letter of your email address.


Tell me what challenges you have experienced with Type 2 diabetes.
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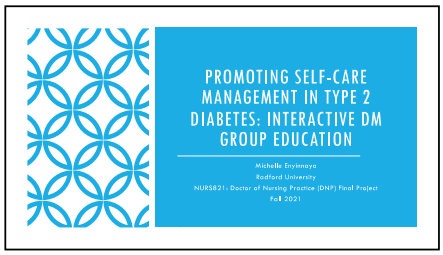
Appendix K

Zoom Educational PowerPoint Slides

9/12/21



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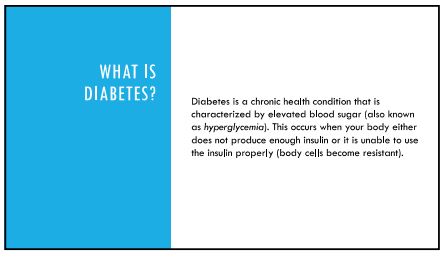

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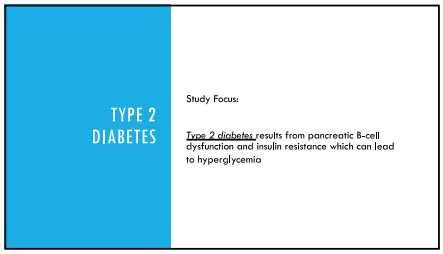

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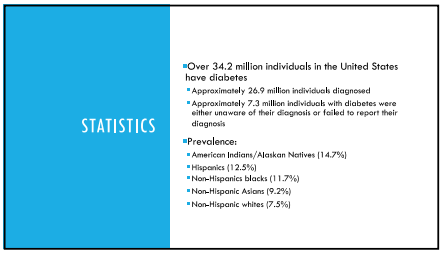

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9/12/21

STATISTICS

- Type 2 diabetes is responsible for 90-95% of diabetes cases
- In 2017, the medical expenses for diabetes in the United States averaged a total of $327 billion
  - $16,752 per individual each year
- Annual medical expenses for individuals with diabetes are 2.3 times greater than an individual without a diagnosis of diabetes
- Virginia Statistics:
  - 631,194 individuals living in the state of Virginia have diabetes, with 2.1 million individuals with prediabetes

7

RISK FACTORS

- Age
- Overweight or obesity
- Fat distribution
  - Waist circumference > 40 inches in men and > 35 inches in women
- Decreased physical activity/sedentary lifestyle
- Family history
- Race/Ethnicity
  - More common in Black, Hispanic, Native American, and Asian races
- Low levels of good cholesterol, high levels of triglycerides
- Prediabetes
- Pregnancy-related (Gestational)
- Polycystic ovary syndrome

8

SIGNS AND SYMPTOMS

- Frequent urination, often at night
- Always thirsty
- Unintended weight loss
- Increased hunger
- Blurry vision
- Numbness or tingling in hands or feet
- Fatigue
- Dry skin
- Sores that heal slowly
- Increased infections

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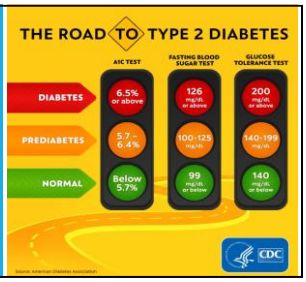
DIAGNOSIS



10

PREVENTION & TREATMENT

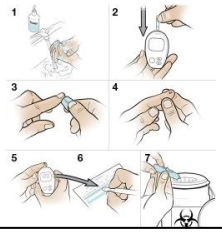
- Monitoring blood sugar
- Healthy diet and nutrition
- Increase activity levels
- Avoid or limit inactivity
- Weight loss
- Medication therapy

11

SELF-MONITORING OF BLOOD GLUCOSE (SMBG)

Checking your blood sugar

- Check your blood sugar a few times a day, typically before meals and at bedtime.



12

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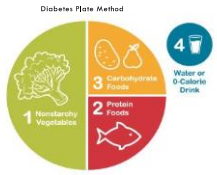
ADA targets for Blood Sugar Your doctor's targets for you may differ	My Goals	My Results
Before meals: 80 to 130 mg/dl	_____ to _____	_____ to _____ Date: _____ Time: _____ Note: _____
1-2 hours after meals: Below 180 mg/dl	_____ to _____	_____ to _____ Date: _____ Time: _____ Note: _____

SELF-MONITORING OF BLOOD GLUCOSE (SMBG)

13

NUTRITION



1. Fill 1/2 of your plate with non-starchy vegetables
2. Fill 1/4 of your plate with lean protein foods
3. Fill 1/4 of your plate with carbohydrates
4. Drink water or a zero to low-calorie drink

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NUTRITION

Non-starchy vegetables
- Asparagus
- Broccoli/Cauliflower
- Cabbage
- Carrots
- Leafy greens (kale and collards)
- Cucumbers
- Celery
- Mushrooms
- Green beans
- Bell peppers
- Salads (spinach, lettuce, arugula)
- Squash
- Tomatoes

Lean Protein Foods
- Chicken
- Turkey
- Eggs
- Fish (salmon, cod, tuna, tilapia)
- Shrimp, scallops, clams, mussels
- Lean beef
- Lean pork
- Lean deli meats
- Cottage cheese
- Plant-based (beans, lentil beans, nuts, nut butters, edamame, tofu)

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NUTRITION

Carbohydrates
- Whole grains (brown rice, popcorn, quinoa, oatmeal)
- Whole grain foods (bread, pasta)
- Starchy vegetables (acorn or butternut squash, plantain, potatoes, pumpkin, sweet potatoes or yams)
- Beans and legumes
- Fruits (dried fruits as well)
- Dairy (milk, soy milk, yogurt)

- *(Note: High carbohydrate foods tend to cause blood sugars to become elevated, so we want to monitor and limit our total intake.)

Water or Low-Calorie Drinks
- Unsweetened tea or coffee (iced or hot)
- Unsweetened sparkling or flavored water
- Diet sodas and other beverages

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EXERCISE

- Important part of diabetes journey and health maintenance
- Check with provider to make sure certain exercises are safe to do
- ***Types of Exercises***
  - Aerobic exercise for at least 150 minutes per week or 30 minutes a day for 5 days a week – walking, swimming biking, running
  - Resistance exercise at least 2-3 times a week to improve strength, balance, and flexibility – yoga, weight-lifting
  - Limit inactivity – avoiding sitting for long periods of time, take standing/walking breaks at least every 30 minutes

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WEIGHT LOSS

- Weight-loss surgery is an option for individuals with a body mass index of 35 and above.
- In individuals with more severe diabetes, weight-loss surgery may occur with a body mass index lower than 35.
- Requires lifelong commitment to eating healthy and exercising
- Possible side effects such as nutritional deficiencies and osteoporosis due to inability to absorb nutrients.

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MEDICATIONS

In addition to healthy eating, exercise and weight loss, there are several types of medications that help to lower blood sugar level. This includes the following drug classes:

- Alpha-glucosidase inhibitors (Acarbose, miglitol)
- Biguanides (Metformin)
- Bile Acid Sequestrants (BASs) (Welchol)
- Dopamine-2 Agonists (Bromocriptine)
- Dipeptidyl peptidase-4 (DPP-4) inhibitors (Alogliptin, linagliptin, sitagliptin)

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MEDICATIONS

Drug classes continued:

- Meglitinides (Nateglinide, repaglinide)
- Sodium-glucose transporter 2 (SGLT2) inhibitors (Empagliflozin, canagliflozin, dapagliflozin)
- Sulfonylureas (Glimepiride, glipizide, glyburide)
- Thiazolidinediones (TZDs) (Pioglitazone)
- Oral combination therapy (biguanide + sulfonylurea together)
- Insulin therapy (Short-acting versus long-acting insulin)

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COMPLICATIONS

- Diabetic ketoacidosis
- Heart and blood vessel disease
- Nerve damage (Neuropathy)
- Kidney disease
- Eye damage

21

COMPLICATIONS

- Skin Infections
- Slow-healing wounds
- Obstructive sleep apnea
- Dementia
- Stroke

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DIABETES CARE SCHEDULE

Daily

- Check your blood sugar on a daily basis
- Do a foot check daily
- Take your diabetes medications as prescribed
- Participate in at least 150 minutes of moderate physical activity each week
- Eat healthy foods that help keep your blood sugar on track and within your target range

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DIABETES CARE SCHEDULE

Every 3 Months

- Hemoglobin A1c blood test
- Visit your doctor for self-care plan

Every 6 Months

- See your dentist for a dental examination
- Hemoglobin A1c blood test
- Visit your doctor for self-care plan

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9/13/21

DIABETES CARE SCHEDULE

Every Year

- Stay up to date on your yearly flu shot
- Have your doctor check your kidney function tests
- Have your doctor check your cholesterol levels
- See an eye doctor for an eye examination
- Get your hearing checked
- Complete foot check

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DIABETES CARE SCHEDULE

One-Time

- Get your Pneumonia vaccination
- Get your Hepatitis B vaccination

As Needed

- Mental health check
- Visit doctor if any new problems or symptoms arise

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PEER SUPPORT GROUP DISCUSSION

INTERACTIVE QUESTIONS

1. How does diabetes affect one's life?
2. Who would you consider your support system?
3. Tell me about your successes with Type 2 diabetes.
4. Tell me about your challenges with Type 2 diabetes.
5. How often should one check their blood sugar and what are the target levels?
6. In what ways to you keep yourself healthy, or plan to get healthy?
7. What are some foods to avoid and how can it help your diabetes?
8. If you haven't already, how do you plan to incorporate the recommended physical activity measures into your current lifestyle?
9. Tell me how you overcome a tough day with management your diabetes.
10. What can happen if diabetes is left uncontrolled?

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REFERENCES

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Appendix L

DNP Project Educational PowerPoint Outline

Slide 1

Hello everyone! My name is Michelle Enyinnaya, and I am a registered nurse and a Doctor of Nursing Practice student researcher for Radford University. I would like to thank you all for joining me today for this interactive, online diabetes educational session. The title of this research study is *"Promoting Self-Care Management in Type 2 Diabetes: Interactive DM Group Education"*. We will focus on diabetes education for the first portion of this session, followed by an interactive peer support group discussion at the end.

Slide 2

The contents of this session will cover the definition of diabetes, the types of diabetes, statistics, signs and symptoms of diabetes, risk factors, diagnostic measures, prevention, management, complications, diabetes care schedule, and lastly a peer support group discussion.

Slide 3

So now let's discuss – what is diabetes? Diabetes is a chronic health condition that is characterized by elevated blood sugar (also known as hyperglycemia). This occurs when your body either does not produce enough insulin or it is unable to use the insulin properly (body cells become resistant).

Slide 4

Now that we have a general understanding of diabetes, let's talk about the different types of diabetes. There are four main types of diabetes: 1) type 1 diabetes, 2) type 2 diabetes, 3) gestational diabetes, and 4) secondary diabetes.

Type 1 diabetes results from a destruction of pancreatic B-cells, leading to insulin deficiency which causes hyperglycemia, or elevated blood glucose.

Type 2 diabetes results from pancreatic B-cell dysfunction and insulin resistance which can lead to hyperglycemia.

Gestational diabetes results from carbohydrate intolerance in women who are pregnant. This type of diabetes may resolve in the postpartum stage, but often places these women at an increased risk for type 2 diabetes in the future.

Lastly, secondary diabetes results from associated conditions such as pancreatic disease, corticosteroid hormone excess, or it can be chemically or drug-induced, leading to hyperglycemia.

Slide 5

As we know, this study will focus on type 2 diabetes. Type 2 diabetes results from pancreatic B-cell dysfunction and insulin resistance which can lead to hyperglycemia (or elevated blood sugar levels).

Slide 6

Now let's talk about the statistics of type 2 diabetes. According to the 2020 *National Diabetes Statistics Report*, over 34.2 million individuals in the United States have diabetes. Of the 34.2 million individuals with diabetes, approximately 26.9 million individuals were diagnosed.

According to the Centers for Disease Control and Prevention (CDC), approximately 7.3 million individuals with diabetes were either unaware of their diagnosis or failed to report their diagnosis.

In the United States, American Indians/Alaskan Natives have the highest prevalence of diabetes (14.7%), followed by Hispanics (12.5%), non-Hispanics blacks (11.7%), non-Hispanic Asians (9.2%), and non-Hispanic whites (7.5%).

Slide 7

According to the CDC, Type 2 diabetes is responsible for 90-95% of diabetes cases. In 2017, the medical expenses for diabetes in the United States averaged a total of $327 billion. As of 2018, the medical expenses for diabetes in the United States averages a total of $16,752 per individual each year, a 26% increase over the last five years.

Annual medical expenses for individuals with diabetes are 2.3 times greater than an individual without a diagnosis of diabetes.

According to the Virginia Department of Health, 631,194 individuals living in the state of Virginia have diabetes, with 2.1 million individuals with prediabetes. These increasing healthcare costs associated with diabetes should encourage healthcare providers to educate diabetic patients on the risk factors, maintenance, and consequences of diabetes to improve disease management.

Slide 8

Now let's discuss the risk factors of type 2 diabetes. Some of the most common risk factors include increasing age and being overweight or obese. An increased in fat distribution or waist circumference greater than 40 inches in men and greater than 35 inches in women can also lead to an increased risk for type 2 diabetes.

Other risk factors include decreased physical activity or sedentary lifestyle, a family history of diabetes, and race and ethnicity – it is more common in Black, Hispanic, Native American, and Asian races.

Low levels of good cholesterol, high level of triglycerides, prediabetes, pregnancy-related (or gestational) diabetes and polycystic ovary syndrome.

Slide 9

Some of the common signs and symptoms of type 2 diabetes to monitor for include frequent urination, often at night, constant feelings of thirst, unintended weight loss, increased levels of

hunger, blurry vision, numbness or tingling in your hands or feet, fatigue, dry skin, sores that heal slowly, or increased infections.

Slide 10

This is a photograph of the road to type 2 diabetes. A clinical diagnosis of diabetes is typically made by history and physical (of common signs and symptoms) along with the following indications: 1) a fasting blood glucose > 126 mg/dL, 2) a two-hour (or random) plasma glucose >200 mg/dL, or a glycated hemoglobin (HbA1c) >6.5%.

Slide 11

Now we will talk about the general ways to prevent and treat type 2 diabetes and go into further detail in the upcoming slides. Prevention and treatment methods include monitoring your blood sugar regularly, eating a healthy, nutritional diet, increasing your activity levels, avoiding or limiting inactivity, weight loss, and medication therapy.

Slide 12

A key factor in diabetes maintenance is self-monitoring of blood glucose or checking your blood sugar. This photograph here will take your through the steps of checking your blood sugar.

The steps are as follows:
Make sure glucose meter is ready for use.
Wash your hands thoroughly with warm water and soap.
Place glucose strip inside glucose meter.
Prick finger using lancet to draw a drop of blood.
Place drop of blood onto strip in glucose meter and wait for results.
Write down blood sugar number in daily blood sugar log.
Dispose of lancet and strip properly in container.

Research indicates it is important to check your blood sugar a few times a day, typically before meal and at bedtime. Please follow the recommend guidelines given to you by your health care provider.

Slide 13

It is important to keep a daily log of your blood sugars as often as you can. According to the American Diabetes Association, the target blood sugar before meals is 80 to 130 mg/dl, and the target for one to two hours after meals is below 180 mg/dl. Again, please follow the recommended guidelines given to you by your health care provider.

Slide 14

Now let’s discuss nutrition. The American Diabetes Association uses the Diabetes Plate Method guidelines which is shown here in this photograph.

These guidelines recommend that you:
1. Fill 1/2 of your plate with non-starchy vegetables
2. Fill 1/4 of your plate with lean protein foods
3. Fill 1/4 of your plate with carbohydrates
4. Drink water or a zero to low-calorie drink

Slide 15

Some of the recommended non-starchy vegetables include:
Asparagus
Broccoli/Cauliflower
Cabbage
Carrots
Leafy greens (kale and collards)
Cucumbers
Celery
Mushrooms
Green beans
Bell peppers
Salads (spinach, lettuce, arugula)
Squash
Tomatoes

Some of the recommended lean protein foods include:
Turkey
Eggs
Fish (salmon, cod, tuna, tilapia)
Shrimp, scallops, clams, mussels
Lean beef
Lean pork
Lean deli meats
Cottage cheese
Plant-based (beans, lentil beans, nuts, nut butters, edamame, tofu)

Slide 16

The recommended carbohydrates to consume include:
Whole grains (brown rice, popcorn, quinoa, oatmeal)
Whole grain foods (bread, pasta)
Starchy vegetables (acorn or butternut squash, plantain, potatoes, pumpkin, sweet potatoes or yams)
Beans and legumes
Fruits (dried fruits as well)
Dairy (milk, soy milk, yogurt)

Please note that high carbohydrate foods tend to cause blood sugars to become elevated, so we want to monitor and limit our total intake.

And lastly for water or low-calorie drinks, the recommendations include:
Unsweetened tea or coffee (iced or hot)
Unsweetened sparkling or flavored water
Diet sodas and other beverages

Slide 17

Another key factor in diabetes maintenance is exercise. Exercise is an important part of your diabetes journey and health maintenance. Check with your provider to make sure certain exercises are safe for you to do.

Some of the recommended types of exercise include aerobic exercise for at least 150 minutes per week or 30 minutes a day for 5 days a week. Examples of aerobic exercises are walking, swimming, biking, and running. Resistance exercise can be done at least 2-3 times a week to improve strength, balance, and flexibility. Examples of resistance exercise are yoga and weightlifting. Lastly, we want to focus on limiting our inactivity. This can be achieved by avoiding sitting for long periods of time and take standing/walking breaks at least every 30 minutes.

Slide 18

Weight-loss surgery is an option for individuals with a body mass index of 35 and above. In individuals with more severe diabetes, weight-loss surgery may occur with a body mass index lower than 35. Weight loss requires a lifelong commitment to eating healthy and exercising. Some of the possible side effects of weight-loss surgery are nutritional deficiencies and osteoporosis (a condition that results in weakening in the bones) due to inability to absorb nutrients.

Slide 19 & 20

In addition to healthy eating, exercise and weight loss, there are several types of medications that help to lower blood sugar level. This includes the following drug classes:

- Alpha-glucosidase inhibitors (Acarbose, miglitol)
- Biguanides (Metformin)
- Bile Acid Sequestrants (BASs) (Welchol)
- Dopamine-2 Agonists (Bromocriptine)
- Dipeptidyl peptidase-4 (DPP-4) inhibitors (Alogliptin, linagliptin, sitagliptin)
- Meglitinides (Nateglinide, repaglinide)
- Sodium-glucose transporter 2 (SGLT2) inhibitors (Empagliflozin, canagliflozin, dapagliflozin)
- Sulfonylureas (Glimepiride, glipizide, glyburide)
- Thiazolidinediones (TZDs) (Pioglitazone)
- Oral combination therapy (biguanide and sulfonylurea together)
- Insulin therapy (Short-acting versus long-acting insulin)

Please work closely with your health care provider to choose the medication regiment that will work best for you.

Slide 21

Now that we have discussed prevention and management, we will talk about some of the complications of type 2 diabetes. One of the complications is diabetic ketoacidosis caused by a lack of insulin production, resulting in high blood sugars and production of ketones. This is a

serious complication that must be treated immediately. Other complications include heart and blood vessel disease (high blood pressure and stroke), nerve damage which can result in a numbness and tingling sensation also known as neuropathy, kidney disease, and eye damage which could lead to possible blindness.

Slide 22

Other complications include an increase in bacterial or fungal skin infections, slow-healing wounds, obstructive sleep apnea, dementia, and stroke.

Slide 23

A diabetes care schedule was developed by the CDC to help prevent and reduce type 2 diabetes complications. It is recommended that you check your blood sugar on a daily basis, before meals and at bedtime or as often as recommended by your provider.

Do a foot check daily. Use a mirror or ask a family member or household member to help you check for any cuts, open wounds, sores, or changes in your toenails or skin.

Take your diabetes medications as prescribed.

Participate in at least 150 minutes of moderate physical activity each week. This can be broken down into several different ways: Approximately 20 minutes a day for 7 days a week, 30 minutes a day for 5 days out of the week or split up however works best with your schedule.
Eat healthy foods that help keep your blood sugar on track and within your target range.

Slide 24

Every 3 months, it is recommended for you to get a hemoglobin A1c blood test and visit your doctor to develop or maintain a self-care plan.

Every 6 months, it is recommended that you see your dentist for a dental examination, get a hemoglobin A1c text, and visit your doctor to develop or maintain a self-care plan.

If you find yourself having a difficult time maintaining your target blood sugar range or you have recently adjusted your diabetes medications, have your blood work done once every 3 months to make sure you are on track.

If you are meeting your diabetes goals, have your blood work done once every 6 months to make sure you are maintaining your diabetes care-plan goals.

Slide 25

Every year it is recommended for you to

- Stay up to date on your yearly flu shot
- Have your doctor check your kidney function tests
- Have your doctor check your cholesterol levels
- See an eye doctor for an eye examination
- Get your hearing checked
- Complete a thorough foot check

Slide 26

Lastly, it is recommended that you get your Pneumonia and Hepatitis B vaccination series once and have a mental health check done or visit your doctor if any new problems or symptoms arise as needed.

Slide 27

Now we will move into the peer support group discussion portion of this presentation. I will open the floor to interactive group discussion by asking 10 interaction-guided questions and allow you all to talk with each other and give your statements and opinions to each question. Please remember, if you do not feel comfortable, you are not obligated to answer the questions or participate in the discussion.

INTERACTIVE QUESTIONS

1. How does diabetes affect one's life?
2. Who would you consider your support system?
3. Tell me about your successes with type 2 diabetes.
4. Tell me about your challenges with type 2 diabetes.
5. How often should one check their blood sugar and what are the target levels?
6. In what ways to you keep yourself healthy, or plan to get healthy?
7. What are some foods to avoid and how can it help your diabetes?
8. If you haven't already, how do you plan to incorporate the recommended physical activity measures into your current lifestyle?
9. Tell me how you overcome a tough day with management your diabetes.
10. What can happen if diabetes is left uncontrolled?

Slide 28 & 29

This concludes the presentation for today. I would like to thank you all for your participation in this educational session and peer interactive group discussion. I will post a link in chat box for your follow up diabetes research questionnaire and send the link out in an email. Please complete the questionnaire at your earliest convenience. Thank you again and have a great day!

Appendix M

Letter of Key Support

Northern Virginia Internal Medicine & Pediatrics
2501 N Glebe Rd
Unit #301
Arlington, VA 22207
(703) 527-6664

Radford University
801 E Main St
Radford, VA 24142
(540) 831-5000

RE: RU IRB Letter of Support

Dear Radford University Institutional Review Board Chair and Members:

On behalf of Northern Virginia Internal Medicine & Pediatrics, we are writing to grant permission for Michelle Enyinnaya, a Doctor of Nursing Practice student investigator at Radford University, to conduct her research project titled, *"Promoting Self-Care Management in Type 2 Diabetes: Interactive DM Group Education"* with the assistance of Principle Investigator, Dr. Carey Cole.

We understand that Michelle Enyinnaya will recruit 35 of our adult patients with Type 2 diabetes to conduct a telehealth-based study and request Diabetes Self-Management Questionnaire (DSMQ) pre- and post-educational session completion by participants.

We are happy to participate in this research project as we recognize that the results will be used to improve health maintenance of our adult patients with Type 2 diabetes in our clinic. Therefore, as representatives of Northern Virginia Internal Medicine & Pediatrics, we agree that Michelle Enyinnaya's research project may be conducted at our clinic.

Sincerely,

Mary Ellen Gallagher, M.D.

Callie Adams, FNP-C

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